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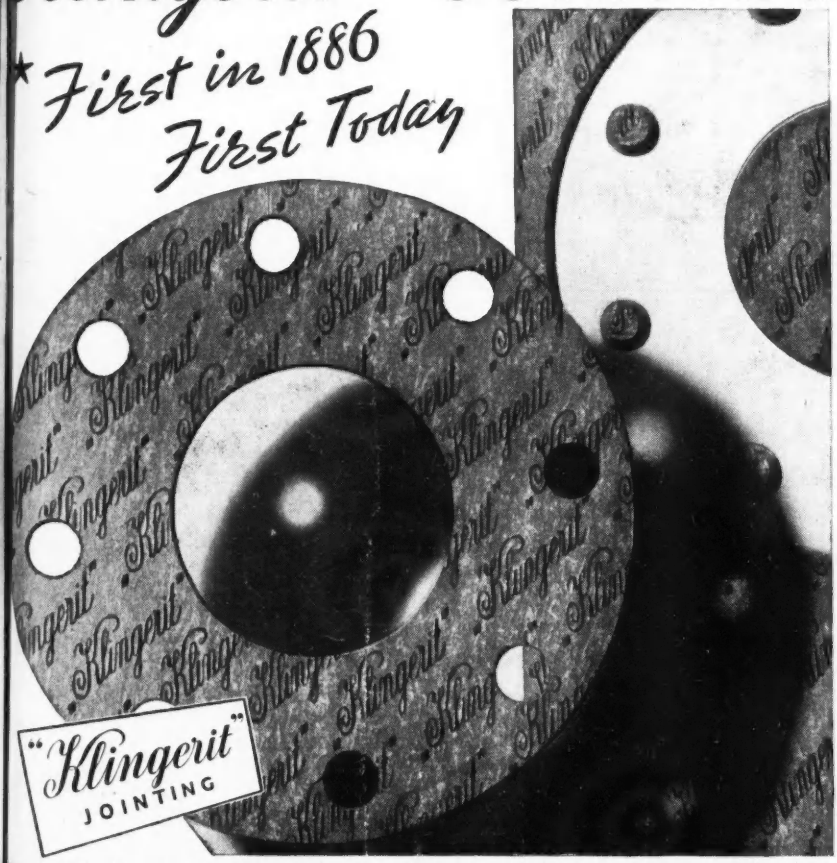

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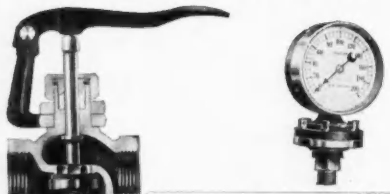

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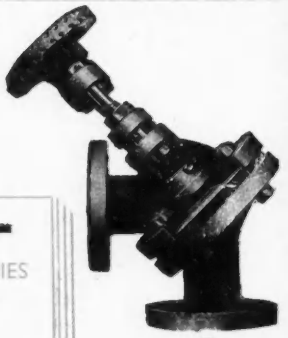

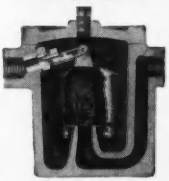

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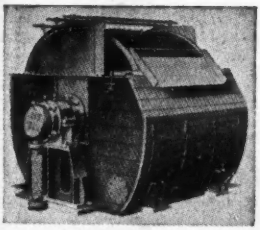

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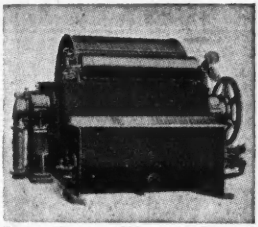

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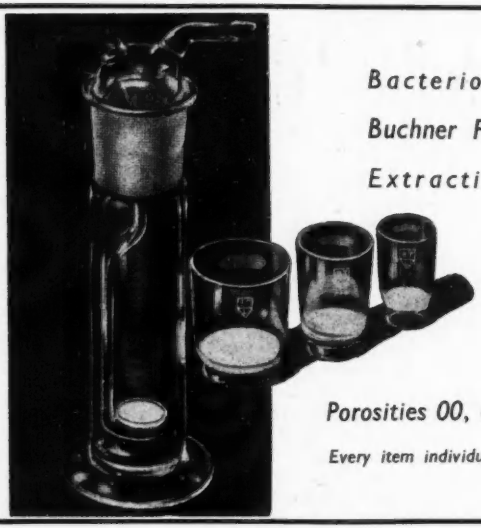

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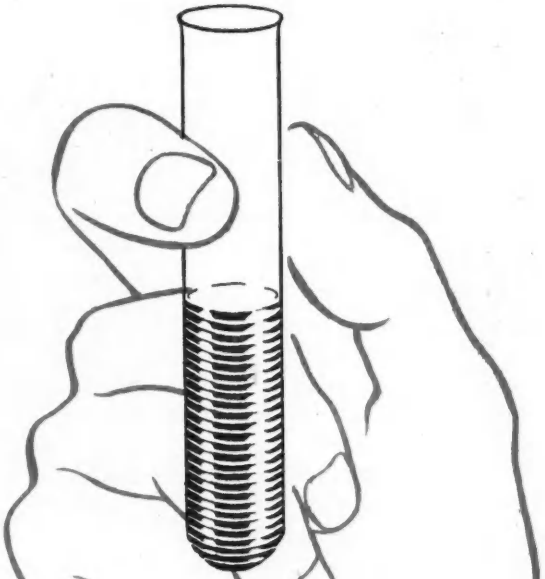

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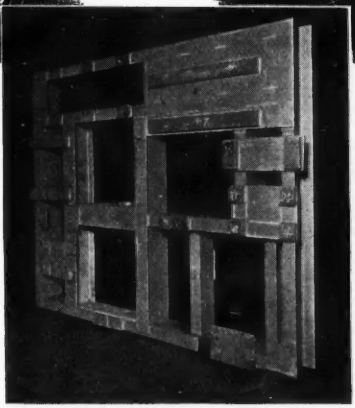

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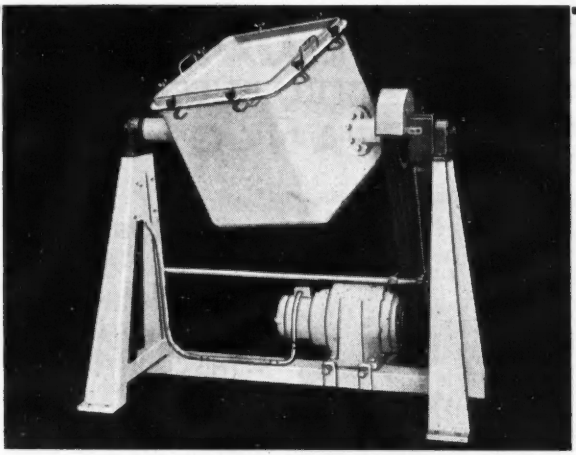

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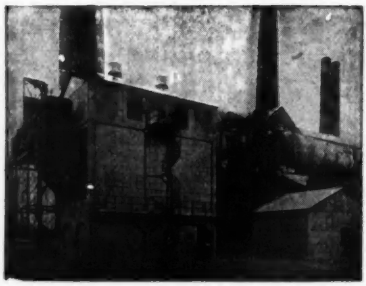

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Implications of the Gas Bill

WITH the publication of the Bill to nationalise gas undertakings, the shadow of State control seems to have fallen across the chemical industry. The manufacture of gas fuel is a chemical operation, as we were reminded by the Heyworth report on the gas industry in which it was laid down that there should be no such thing as a gas engineer; he is a particular species of the genus *chemical engineer*. More important still, the gas industry and the coke-oven industry, forming essentially one industry narrowly divided, will now be given powers to manufacture chemicals and, being very large corporations, are likely to use those powers when it seems to them good to do so.

Each of the Area Boards to be responsible for the 12 areas into which the whole country is to be divided is autonomous, able to do many things which will be detailed later, in addition to the duty of developing and maintaining an efficient system of gas and coke supply. These Boards "shall reduce so far as practicable, the price of gas and coke and avoid undue preference in the supply of gas and coke." Finally, each of these Boards must so order its business that its revenues "are not less than sufficient to meet its outgoings." The activities of the Area Boards are to be co-ordinated by a Gas Council composed of the chairman of the Area Boards and presided over by a neutral chairman and deputy chairman. The Gas Council has mainly an advisory function and if it wishes to bite an Area Board it must get the Minister to bite on its behalf.

All this may seem remote from the chemical industry proper except in relation to the consumption of gas. But in order to reduce the price of gas an Area Board may decide to undertake ancillary manufactures. The Bill gives the gas industry the usual powers to manufacture and distribute gas, coke and by-products, and to sell the necessary appliances. It adds also that the Boards may "manufacture, treat, render saleable, supply or sell" the following: "any by-products made or derived from gas, coke or any such other solid fuel aforesaid or any by-product obtained as aforesaid." This means, for example, that the gas Boards are entitled to take up the Fischer-Tropsch process; they may manufacture synthesis gas from gas or coke and from that synthesis gas they may make whatever products are sufficiently remunerative. They may take over the whole business of tar distillation. In other words, the new gas Boards could become a vast organic chemical industry, manufacturing whatever chemicals can be derived from coal by the accepted processes of chemical synthesis.

What the attitude of the chemical industry will be towards these powers, it is too early to say. The manufacture of synthetic chemicals is so intricate a matter that only a big corporation can profitably tackle it. If the new gas Boards believe that there is sufficient profit to help to reduce the price of gas, they will go into that business; it might not be a bad thing to have a large and wealthy corporation willing to provide smaller chemical undertakings with the intermediates they need.

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But it opens the door quite a long way towards State trading in the chemical industry. That may prove dangerous authority to give to a Minister of Fuel and Power in a socialist government bent on nationalising every industry.

Nor is this all. The chemical plant manufacturing industry is also threatened. The Area Boards " after consultation with the Gas Council " may " manufacture plant required by the Board or any other Area Board. . . . " This reads at first sight as if it meant that the Boards can build for themselves their own gas retorts, make their own condensers, gasholders and the like if they so desire. But the powers are wider than that, for since they permit the manufacture of chemicals, they permit also the manufacture of whatever chemical plant the Board requires to carry on its chemical syntheses.

Whether these powers will ever be used is, of course, problematical, but because it is uncertain, there is no assurance that each and every one will not be used. Since the Board may make for itself, it can acquire works in which to manufacture, and the initial difficulties could readily be got over by buying a going concern and enlarging it according to requirements. It is true that in some respects the powers given to the gas Boards are no greater than those given in the Articles of Association to many gas undertakings. It is one thing to give those powers to a small, or relatively small gas undertaking and another thing to give them to a huge nationally-owned corporation able to stand losses and, if the Coal Board is a typical example, may not be very much concerned if huge losses occur.

Provision is made in the Bill for research work. This, it appears, is to be carried on essentially under the ægis of the Gas Council, though the Council may delegate research to any Area Board. Area Boards can only conduct research in accordance with arrangements made with the Gas Council and with the approval of the Gas Council. No doubt this provision is made to ensure that research is properly co-ordinated. If the words mean what we think they mean, however, the provision could curtail the research of the gas industry.

Powers are also possessed by the National Coal Board for the carbonisation of coal and working up of products. The Government, having awarded certain coke ovens to the N.C.B., has not had the courage to bring all carbonisation (other than at steel works) under a single Board. More's the pity! But it has done the next best thing which is to insist that the two Boards shall consult together upon all their schemes and shall not work independently.

Finally, some chemical works may produce gas which they cannot use themselves. Under the provisions of the Bill " the Area Board in whose area gas is manufactured by any person may require that person to sell to the Board all or part of the gas manufactured by him which he does not require for his own use, and the said person shall comply with that requirement."

NOTES AND COMMENTS

Salesman's Holiday

RECOGNITION by an increasing section of opinion in the U.S.A. that their great productiveness, which has been the subject of somewhat complacent parallels with equivalent statistics in this country, is no passport to a new Utopia in present world conditions is one of the more encouraging portents of the moment. As a corollary of the Marshall Plan, the provision of a basis of a more balanced exchange between this country and the chief dollar area is being accorded very much wider acceptance and is beginning to produce some highly unusual results. This week, among the abundant publicity for new American chemical products which comprises a substantial proportion of the daily mail was a folder which struck an entirely new note. It was headed: "What Can You Sell Us?" and the sponsors (the Republic Chemical Corporation, of New York) provided the assurance that as importers and exporters of industrial chemicals, oils, fats, solvents, fertilisers, pigments, gums, dyes, coal-tar derivatives and "everything of a chemical nature" they had outlets throughout the United States and the world. "We have," they hastened to add, "the American dollars to send you." All of which seems to demand an appropriately warm response in the vernacular ("OK, let's trade"), but for the inconvenient facts associated with raw materials, fuel and licences with which every large chemical manufacturer is familiar. This "hands across the Atlantic" motive is, however, a warming gesture, the sincerity of which had previously been shown in discussion with THE CHEMICAL AGE initiated by the American Embassy in London. To be asked "What have you got to sell?" by a country so nearly self-sufficient in chemicals as America is apt to be confusing in existing conditions, with supplies of all the best sellers almost as keenly sought here as they are overseas. Such good news as there is—notably this week's announcement by Murex, Ltd., that it can now supply for powder metallurgy and kindred uses 98 per cent titanium hydride of which the U.S. has formerly been the supplier—is more often concerned with dollar saving than dollar earning. There is, however, no mistaking the sincerity of the American intention, and any information which will help to forward their Embassy's present commercial survey will be very gladly received by THE CHEMICAL AGE and transmitted to the right quarter.

Groundnut Prospects

SINCE optimistic forecasts are traditionally excluded from Government reports—in striking contrast with some Ministerial pronouncements—the progress report, to the end of November last year, on that potentially great supplier of food and some chemical industries, the East African Groundnuts Scheme, provides substance for confidence in the future. Of this undertaking it can be said literally that "The first six years are the hardest" and, since the first of the six is generally the hardest of all, the degree of success attained suggests that substantial dividends in vegetable oil products may be available before the six preparatory years originally mentioned have elapsed. The magnitude of the undertaking, which the report justifiably likens to a military operation, and the experimental nature of what has to be done in the Central Province of Tanganyika Territory, first of the five operational areas, might well have ruled out the possibility of any decisive results at this stage. It was to clear for planting in one year 150,000 acres of virgin bush and to form the organisation and bases for the second wave of the attack. When the East African report was written, progress indicated that all the objectives were likely to be overrun roughly within the time schedule, despite the extraordinary and bizarre problems such as the experiments using Sherman Mark III and later Valentine tanks as agricultural power units. (There are besides at least 420 heavy tractors on the job now.) Possibly the best evidence of the sound foundation on which the project rests is the report on the seven trial plots at Kongwa (some 240 miles by rail from Dar-es-Salaam) which were planted at the beginning of last year. On the basis of their varying yields it is estimated that the average yield of decorticated groundnuts this year, given the same conditions, would be over 900 lb. per acre, compared with the 750 lb. assumed in the first official estimates. And since the

most fertile of the test plots produced up to 1850 lb. per acre the latest estimate of average harvest may in fact have been too conservative. Both in spirit and performance the present pioneer work in East Africa seems to be amply justifying the hope that it will very shortly begin to free us on an increasing scale from our uneasy dependence upon some avaricious suppliers of vegetable oils.

Lead Legislation

LEAD has in this country so long been grouped in the lengthening category of things withheld to greater or less degree by high prices or controls that some stretching of the imagination is required to comprehend the restrictions lately imposed by the State of Queensland, which seeks to reduce the use of lead, not because there is not enough to go round but because it is regarded as undesirable toxic stuff. The new Queensland Act No. 40 amending the local Health Acts incidentally seems to empower the authorities there to control domestic and industrial activities even more intimately than their counterparts do here. The use of lead metal in various forms is sharply restricted in many kinds of consumer goods and the use of lead paint in a number of commodities is forbidden. No toy, for example, may employ lead or lead paint and when recently "a post-war overseas industry" flooded the Queensland market with very attractive lead toys the State Health Department enforced the removal from sale of stock worth thousands of pounds. But perhaps the most remarkable instance of the degree of control which is being exercised in Queensland is contained in the Government report recalling that: "A representative collection of samples of paint taken by our officers from dwellings have been found in many instances to contain more than 5 per cent soluble lead in contravention of the Health Acts. Owners of these premises have been ordered to secure the removal of the offending paint." It should be noted that under current Queensland regulations every package of paint sold must be labelled with the name and address of the manufacturer, the net weight or volume of its contents, and a statement of the percentage proportion of each ingredient of which the paint is composed.

LETTER TO THE EDITOR

Fluid Catalytic Cracking

SIR,—We have read with interest the article on "The Case for Continuous Processes" in THE CHEMICAL AGE, January 24, 1948. In this, reference is made to a continuous process for cracking petroleum. We believe that the intention of the writer of the article was to cite the fluid catalytic cracking process, and in the interests of accuracy, we propose to describe briefly the three major catalytic cracking processes, which appear to have been confused in the article.

The Houdry process is a fixed bed operation, in which the oil vapours are cracked by passage through a static bed of granular catalyst. Carbon is deposited on the catalyst, and is burned off intermittently by a stream of air, the oil vapours to be cracked being diverted to another catalyst tower containing regenerated catalyst.

In the Thermofor catalytic cracking process, a moving bed of catalyst pellets of about 1/16 in. to ¼ in. diameter is employed. Carbonised catalyst is withdrawn from the base of the reaction chamber, conveyed by mechanical elevators to a regenerator where carbon is burned off, and then conveyed to the top of the reactor again to complete the cycle.

The fluid catalytic cracking process uses catalyst in the form of very fine powder, of the order of 20 to 40 microns. The catalyst is maintained in a state of "fluidity" by the passage through it of oil vapours (in the reactor) or air (in the regenerator). In the "fluidised" state the solid behaves as a liquid, *i.e.*, the solid can be made to flow under its own "head." Partly carbonised catalyst is discharged under the "head" of fluidised solids from the reactor through valves and pipes, and is then carried in a "fluidising medium" of air to the regenerator. Here the carbon is burned off by the oxygen of the air, which maintains the bed in a fluidised state. Regenerated catalyst is discharged under the head in the regenerator through pipes and valves and fed by differential head in a fluidising medium of oil vapours to the rector.

We trust that these simplified explanations will serve to clarify the concepts involved in the three types of catalytic cracking processes.

—Yours, etc.,

D. A. C. DEWDNEY.
Esso Development Co., Ltd.,
16 Charles II Street, London, S.W.1.

REPORT ON U.K. INDUSTRIES

U.S. Group Alleges Backwardness and Obsolescence

THE study by industrialists in the U.S.A. of the causes of what they regard as the relative unproductiveness of British industry (of which excerpts were published in THE CHEMICAL AGE, January 31) was released this week by the Machinery and Allied Products Institute, of Chicago. While all who have first-hand knowledge of the industries concerned in this country will recognise that the "post mortem" character of this document is wholly unjustified by the facts, many of the points raised by the largely disinterested authors of the report as warnings to their own industrialists are worthy of consideration here. Particularly interesting is the critical commentary which it incidentally affords of what it regards as the effects of contemporary Government policy as a whole in relation to industry.

A Warning

The report, "Technological Stagnation in Great Britain," is prefaced by this warning to America by the president of the Machinery and Allied Products Institute (Mr. William J. Kelly, Chicago industrialist): "During this period many national policies were adopted that were and are incompatible with the maintenance of a dynamic and expanding economy. Until we reverse these practices, America will have alarming symptoms of a technological decline, similar to that which has overtaken England and France. We must mechanise and modernise faster than we are to-day or our economy, too, will stagnate."

He claimed that in Britain management and labour had been obsessed with a passion for "stability" and "security" which in conjunction with a tax system inimical to enterprise had produced as a logical sequence intervention by the State.

"The principal lesson to be learned," says the president, "is that we must preserve by all means both the spirit and practice of competitive enterprise. By the same token we must preserve the incentives that evoke and reward enterprise. If we fail we shall inevitably retrace in this country the dismal course of industry in Britain, a course now charted for our admonishment."

Obsolescence

The survey quotes the recent report of President Truman's Scientific Research Board: "Since the turn of the century, the British have been paying, in terms of technological obsolescence, the penalty for their early industrial leadership. Particularly in the basic industries, British facilities and technology were older and less efficient than their German counterparts. The balance of power in Europe was upset primarily as a result of this fact, and the world was plunged into two devastating wars. To-day, one of the most serious long term problems still facing the British Government is the modernisation of industrial facilities."

The Institute's report claims to have made full use of the findings of British industrial "working parties," but is of the opinion that the tripartite nature of the working parties—representing management, labour, and government—is another drawback: "There appears in some cases considerable reluctance to criticise the actions or policies of the separate interests represented. Thus, for example, restrictive practices on the part of labour unions or combinations in restraint of competition on the part of management seem at times to be glossed over, if not actually defended."

In order to prepare what is considered a more thorough analysis the Institute chose to base its findings on the reports of the "working parties" supplemented by those made by private and non-governmental investigators, confining its selection "wholly to British sources."

Inadequate Mechanisation

After surveying 25 industries, the results of which purported to show that productiveness in America was almost three times as high as in Great Britain, the report declares that the result is primarily due to the differences in the state of mechanisation in the two countries.

Going further into the subject the Institute declares "that not a single one of the industries investigated is adequately mechanised according to American standards" and goes on to say that in some cases re-equipment on any substantial scale virtually ceased around the turn of the century, and in some others by World War I."

After studying American equipment, for strip coal mining, the Institute's survey notes that the Opencast Mission Report concluded: "We believe that of the British equipment now in use at least one third is incapable of further efficient production, unless it is completely dismantled, rebuilt and equipped with essential spares." It added, "We are deeply impressed throughout by the modern and large capacity equipment used (in the U.S.A.) for stripping, and generally speaking a machine of 2½ cu. yd. capacity is considered in the U.S. to be a small machine for this work, whereas in England a 1¾ cu. yd. machine has been regarded as large. . . . The average capacity

of the machines that we saw in America is over 8 cu. yd., whereas the average capacity of machines used in England is under ¾ cu. yd., excluding any machines obtained from the U.S.A."

Handling Equipment

The deficiency in production machinery is only part of the picture, the Institute declares. The best production equipment can yield only part of its potential if the auxiliary and handling equipment is inadequate.

In the manufacturing industries investigated the widespread use of overhead line-shafts for transmitting power virtually eliminated the feasibility of overhead conveyors. One of the prerequisites for modern handling methods was the substitution of machines powered by individual electric motors.

Auxiliary and handling equipment was given too little attention in Great Britain. "To what extent research and development by British equipment producers have been retarded by the inadequacy of domestic demand, the working-party reports do not permit us to judge," states the Institute. "In some cases, certainly, there has been a substantial offset in export demand. There can be no doubt, however, that in the absence of such an offset the general disinclination of British industry to modernise has placed machinery builders under a serious handicap."

So far as taxation is concerned, the Institute believed that there was little room to doubt that the British tax structure had contributed to technological decay.

"Ever since World War I," it declares, "taxation has fallen with extreme gravity on those sectors of the national income that supply the capital funds of industry, especially its risk capital, namely, corporate earnings and the larger personal incomes. The result has been at once a sharp reduction in the ability of the community to save and an impairment of the incentive for risk taking."

Apart from its erosion of saving and incentives through excessive rates, the tax structure had long hampered re-mechanisation by its treatment of allowances for depreciation. The recognition of obsolescence had been grudging and inadequate.

Failure to Re-equip

"It is to be hoped," the survey states, "that the British nation will arrive in time at a sound appraisal of the significance of its own experience, and of the means and measures appropriate to a restoration of its industrial leadership. The discovery of such means and measures is, however, a task we gladly leave to the British themselves. We have no desire to offer gratuitous advice. But we do wish to point the moral for the United States. For it would be folly for this country to disregard the lessons of experience in Britain, or indeed elsewhere. There is too much at stake. . . .

"So far as we may judge from the territory surveyed by working parties and others, it is safe to say, with only slight risk of exaggeration, that Britain knew how to build great industries but never learned how to rebuild them. At their inception, they were the last word in modernity and efficiency, a model to the world. But they became decrepit with age. What happened was a failure of *re-equipment* policy."

FISH OIL SCHEME : TANGIBLE RESULTS THIS YEAR

AN important advance in the production of fats and proteins is announced by the Herring Industry Board and the Department of Scientific and Industrial Research as a result of joint investigations aimed at eliminating gluts in herring handling. The perennial problem involved in the disposal of herring has been the tendency to periodic boom and slump through the uncertainty of the catch. The efforts of the Herring Industry Board to procure outlets for fish caught are calculated, when fully developed, to eliminate gluts, and provide a substantial addition to the world supply of fats and proteins.

In close association with the Herring Industry Board, scientists of the Torry Research Station of the D.S.I.R. have evolved a new method of treating herrings which would allow widely varying quantities of herrings to be absorbed day by day into pre-treatment plants in which an initial process of preservation takes place. At a later stage, the herrings are broken down by chemical action into their natural constituents the more important of which—edible oil and protein—are suitable for human consumption. Certain industrial uses have already been found for the by-products of the process and further explorations into end-uses are being carried out. A pilot scale chemical reduction plant was set up and operated by the Herring Industry Board at Great Yarmouth, during the autumn herring fishing season of 1947.

Despite present difficulties of supply of plant, machinery and buildings, the board is making strenuous efforts, by improvision and adaptation, to construct the first of a number of reduction plants in time for the 1948 summer herring fishing season.

Chemical Patent Revoked

Important High Court Decision

THE effect of a judgment delivered by Mr. Justice Jenkins in the Chancery Division last week is to render available to more general production an important group of benzine sulphonamido substances hitherto protected by patent rights. The action, which had lasted 17 days, arose from a petition by Boots Pure Drug Co., Ltd., for the revocation of letters patent No. 533495 granted to May & Baker, Ltd., and Ciba, Ltd., for an invention entitled "manufacture of new benzine sulphonamido derivatives."

There was also a motion by May & Baker, Ltd., and Ciba, Ltd., for leave to amend the complete specification upon which the letters patent were granted by substituting for the derivatives mentioned "para-amino-benzine sulphonamido thiazole" and "-4 methyl thiazole." The subject-matter of the application was a convention patent dated January, 1939, in respect of four applications made in Switzerland.

The Judgment

Mr. Justice Jenkins, in his judgment, said the importance of the class of chemical compounds falling within the general description of benzine sulphonamido derivatives lay in the chemo-therapeutic value which some of its members had been found to possess. The discovery of the therapeutic value of sulphanilamide had set many chemists in various countries to work on the problem of producing some further derivative of the parent substance which would possess a wider range of therapeutic activity, particularly against pneumococcal as well as streptococcal infections, and a lower degree of toxicity. The ideal, but probably unobtainable, goal was a drug which would be completely innocuous to the patient.

The judge reviewed the grounds of objection to the specification and said he would allow the petition for revocation of the patent. On the motion to amend the specification he held that the amendments sought to be made would make the invention, as amended, different from the invention claimed by the unamended specification and accordingly were not such as the Court could allow. The motion would be refused.

The judge said the order would lie in the office for six weeks to enable an appeal to be considered. If there was an appeal the order for revocation would be stayed pending judgment in the Court of Appeal.

C

Luxembourg Oil Shale

Coal Shortage Revives Pre-War Plans

CONSIDERABLE interest attaches to the possibility of establishing an industry based on the shale oil deposits of Southern Luxembourg. These deposits are stated to cover an area of approximately 90 sq. km. (34.74 sq. miles) and their thickness varies between 10 and 40 m. Exploitation of these occurrences has been estimated to yield about 45 million tons of shale oil. Tests have shown that 60 litres of crude oil could be produced from one ton of the Luxembourg oil shale, yielding in turn (in litres) 3.1 light benzine, 1.1 heavy benzine, 13.8 kerosene, 5.1 gas oil, 22 lubricating oil as well as 1 kg. of paraffin and 1.6 kg. of ammonium sulphate.

A project to make a solid fuel from these shales has been in existence since 1934, and the post-war lack of coal fuel has revived interest in the idea. The establishment of such an industry would not only conserve the country's foreign exchange, but increase revenue, provide new employment and yield valuable by-products which could be utilised for the manufacture of pharmaceutical products. Tests in Germany of sample oil shale briquettes have shown that the fuel has a calorific value of 4300 to 4500 and ash content of 37 per cent. Production costs per ton, including the addition of coal-dust and tar, amount to 363 francs. The deposits should last several hundred years, it is reported.

LINSEED OIL FACTS WITHHELD

THE recent remarks of Sir Michael Nairn (THE CHEMICAL AGE, January 24) on supplies of linseed oil for the linoleum industry, and Sir Stafford Cripps' refusal in Parliament to compare amounts available in the various using industries, have been taken a stage further by *The Cabinet Maker*, which has made a useful contribution to this question. Asked last week if he could account for Sir Stafford Cripps' attitude, Sir Robert Nairn, managing director of the company, said :—

"I am amazed. The information asked for was readily supplied on previous occasions. The only reason I can offer is that the Chancellor does not want to put the industry in the position of questioning actions taken by the Board of Trade, or any of his other departments. I hope Members of Parliament will realise that a definite principle becomes involved, because if this is allowed to pass, it can only mean a further development of bureaucratic dictatorship."

PRINCIPLES OF THE PILOT PLANT—II

Determining Size and Step-Up

by H. L. LARCOMBE

THERE is no hard and fast rule for determining the size of a pilot plant. Again, experince is the essential quality and one for which there is no substitute. There are, however, some common factors which influence the fixation of size. Broadly, the decision must be based upon the principle that it should be the smallest unit that will actually duplicate the working conditions of the commercial plant.

The ratio of pilot plant to commercial plant is again not one of physical dimensions but rather one of performance and quantity. The question which remains to be answered is generally the same in all plants: "What is the step-up ratio which our workers can safely handle?" To this, also, only experience can provide the answer. A step-up of 1 to 5 may be a risk with inexperienced workers, whereas a step-up of 1 to 100 and more is often possible with experienced staff.

In Miniature

Determination of the bases of the step-up ratio will depend on the type of process and the most important reactions to be studied. If, for instance, the process is one in which heat transfer is all-important the step-up ratio will naturally be based on this with other considerations relegated to secondary importance. In such a case a heat exchanger could be of single tube with flow characteristics of the value of those which would exist in the full-scale plant. The capacity of the exchanger could then be amplified to the size required by the commercial plant by multiplying the number of tubes. In this instance reaction and heat transfer would be the same, the only difference being in the quantity of throughput. If contact time is the overriding consideration, that obviously must be the basis of the step-up ratio.

Compromises have, of course, to be made where unit processes have equal importance in the overall scheme but cannot be studied on the same basis. It is even possible to have a definite hold-up between certain processes which require to be studied on a different basis, and still acquire data from which a commercial plant can be designed. Typically, a process may have an evaporation stage in which the method of salt removal has to be studied primarily and heat exchange secondarily, and a distillation stage where primarily the rate of distillation at varying pressures is the main consideration.

These two phases have definitely different bases for determining the step-up ratio, but there is no reason why interruption should not be made if it does not harm the material being processed. Naturally, the overall picture must be kept in its correct relative parts and the results brought into line when designing the commercial plant.

It is a good axiom, therefore, that if the plant can be broken down into distinct unit processes and the studies carried out as independently as is possible, keeping in mind the co-ordination of the whole plant data, then the step-up ratio can be different for each of the unit processes. This, of course, must involve a certain degree of hold-up between the several unit processes and requires careful thought and experience from the engineers of the commercial plant in translating the data, so that no uneconomical discontinuity occurs.

Wherever possible, however, the step-up ratio in all stages should be the same. This is not difficult to understand: it avoids a great deal of complication in certain stages of the presentation of the data. Product process times and running costs, for instance, do not require to be brought to a common basis of comparison.

The Chief Criteria

Broadly speaking, therefore, three main factors combine to regulate what size the pilot plant is to be:—

a. It should be the smallest practical size which will exactly duplicate the working conditions of the commercial plant.

b. It should use the largest step-up ratio which the people available are qualified to employ and successfully translate into a commercial plant.

c. The degree to which the plant can be split up into unit processes capable of being studied independently, possibly at different step-up ratios, without interfering with the translation and co-ordination of the data obtained.

Who should operate a pilot plant? A research chemist? a chemical engineer? or a promising young mathematician? Probably a combination of them all would be the ideal, but since "all-rounders" are seldom available let us look at the qualities required and the purposes to which they are to be applied. We wish to know how we should

design and construct and operate a plant to make a specified product efficiently and at a profit.

To design, construct and operate demand primarily the translation of data and anticipation of complications which only experience of actual plant operation and management can teach adequately. The design engineer should also be present because the next stage in the programme, *viz.*, the design and layout of the commercial plant is in his department. He can recognise the likely methods of construction, layout and operation. It is advisable also to ask the time and motion study department to see test runs so that they may get some ideas on the subject and discuss the most economical operating layout with the design department.

If possible, a good chemist or chemical engineer should be assigned to have a watching brief through all stages of the job. In this manner continuity can be achieved and duplication of much essential work avoided. Mistakes and false assumptions can, of course, also be duplicated if the chemist who saw the preceding step and will see the subsequent steps is absent at this stage.

Therefore, in the selection of people for the job, choice should fall on those who are co-operative, who have experience, imagination and knowledge, who are not afraid to get dirty and are observant and writers of lucid reports. They must be able to analyse data and be enthusiastic enough to "sell" their ideas to executives.

The right men and the right thinking are, in short, the fundamentals.

Data

The data required vary with every project, but a check list of the most probable items will be useful. This has been compiled by Frank C. Vilbrandt, of Virginia Polytechnic Institute, U.S.A., a well known writer on chemical engineering equipment design.

1. *Flow Relations.*
   - a. Chemical flow diagrams.
   - b. Breakdown in unit operations.
   - c. Engineering equipment flow diagrams.
2. *Materials.*
   - a. Raw materials, availability, substitute raw materials, cost.
   - b. Impurities in raw materials and in products.
   - c. Corrosion, erosion, dust, fumes.
   - d. Solvents.
   - e. Wastes and Recovery

(*Continued in next column*)

3. *Equipment or Operation.*
   - a. Selection of equipment, elimination of obviously unsuitable equipment.
   - b. Cost of operation.
   - c. Control specification.
   - d. Materials of construction.
   - e. Heat transfer.
   - f. Mass transfer.
4. *Materials Handling.*
   - a. Proper methods of handling around the plant.
   - b. Intermediate storage.
   - c. Industrial hazards (corrosion, fire, erosion, safety, health, pollution, fumes, explosions).
   - d. Public nuisances.
   - e. Storage.
5. *Labour.*
   - a. Operators needed.
   - b. Supervision.
   - c. Control specification from operator's viewpoint.
   - d. Process simplification from operators' viewpoint.
   - e. Safety from operators' viewpoint.
   - f. Economy of time and labour.

(*Concluded*)

Aluminium Agreement

Jugoslavia and Hungary

THE closer economic co-operation between the countries of South Eastern Europe is exemplified by the reported conclusion of a fifteen-year agreement between Hungary and Jugoslavia involving co-operation in the production of aluminium. Hungarian bauxite is to be sent to Strnisce and Mostar, Jugoslavia, where Hungarian firms are erecting two refineries with annual productive capacities of 20,000 metric tons each. Construction costs are estimated at 15-20 million dollars.

40,000 Tons of Bauxite

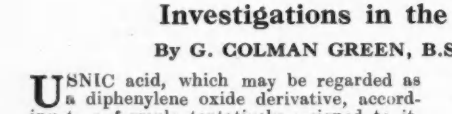
It is reported that Jugoslavia has agreed to import 40,000 tons of bauxite annually at world prices, and to deliver to Hungary 50 per cent of the purified metal on the same price basis. Jugoslavia is to supply caustic soda required in the manufacturing process—3000 metric tons this year, 10,000 tons next year, and 15,000 tons annually as from 1950. The agreement also makes provision for far-reaching co-operation in sales policy both for bauxite and aluminium metal, the establishment of a joint market research organisation, and mutual exchange of technical information.

PROGRESS IN DRUGS AND FINE CHEMICALS—V

Investigations in the Polypeptide Group

By G. COLMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

USNIC acid, which may be regarded as a diphenylene oxide derivative, according to a formula tentatively assigned to it, has been found to inhibit *M. tuberculosis* strongly and to suppress the infection when induced experimentally in guinea-pigs. The simpler 2-aminodiphenylene oxide, as its



USNIC ACID (III)

hydrochloride, inhibits growth *in vitro* at 1/100,000, while its monochlorinated derivative, (III), completely inhibits at 1/400,000 and partially inhibits at 1/1,000,000.

These investigations open up an entirely new field for research into the relationship between chemical constitution and antitubercular activity.

Chlorine Stimulus

It may be of interest to point out, in passing, that enhancement of germicidal activity has also been demonstrated by the introduction of halogen into quaternary ammonium compounds. Lawrence *et al.* (*J. Amer. Pharm. Ass.*, 1947, *36*, 353) found that, in general, the introduction of either two or three chlorine atoms into the benzyl radical of alkyldimethybenzyl ammonium chlorides gave compounds of higher germicidal activity than where the benzyl radical carried either one or no chlorine atoms.

Brownlee *et al.* (*Lancet*, 1947, ii, 897), have described therapeutic trials with streptomycin and a new drug, "sulphetrone" (to which reference is made for the first time) in tuberculosis. At the time of writing full reports of sulphetrone are "in the Press"; but preliminary information shows that, like promin and diasone, which have been used in tuberculosis with some indications of success, sulphetrone is a sulphone derivative. It is actually 4 : 4'-bis (α-phenyl-N-propylamino)-diphenylsulphenetetrasodium sulphonate.

The new drug is stated to compare favourably with promin in the control of experimental tuberculosis in animals and is to be preferred because of its lack of acute and chronic toxicity. The treatment aims at maintaining the drug at a blood-level of 7.5-10.0 mg. per 100 ml. blood with a daily dose of up to 6-9 grams.

There can be little doubt that, mainly under the stimulus of the discovery of streptomycin with its tuberculostatic properties, a great deal of work on tuberculostatic agents has been initiated. It is not unreasonable to conclude that there is real hope that, if the research work in this field continues to grow at the pace which has been established during the past five years, tuberculosis may ultimately be controllable by chemotherapeutic means.

Polypeptide Developments

Among the polypeptide-type antibiotics such as gramicidin, gramicidin-S, tyrocidin, subtilin and bacitracin, advances in treatment have not been extensive. This circumstance follows broadly from their too great toxicity. Nevertheless, tyrothricin (a mixture of gramicidin and tyrocidin) has now been marketed for some time past in the U.S.A. for the treatment of topical infections in suitable conditions. The main advances in this section of the antibiotics field is in connection with the elucidation of structure.

Some interesting problems have been posed in the field of polypeptide chemistry. Chain summarised our knowledge of this group of simple polypeptides at the Dundee meeting of the British Association (*Nature*, 1947, *160*, 554) and pointed out that the proportions of the constituent amino acids were known in the cases of the two gramicidins and tyrocidin. Each contains amino acids of the "unnatural" d-configuration. Gramicidin-S (first isolated in U.S.S.R.) is the simplest in structure and is a dekapeptide in which two basic pentapeptide units are linked in a cyclic structure. The basic pentapeptide unit in this case is:—

α-l-valyl-l-ornithyl-l-leucyl-d-phenylalyl-l-propyl

There are a number of interesting biochemical and biological problems implied in these structures. Among them is one concerning the comparative toxicity of these antibiotics, for there is no reason to suppose that a dekapeptide of this type containing simple amino acids, each of which is non-toxic, should possess any toxicity.

Another problem is the specificity of action and here a study of structure may, it is thought, throw light on the constant

recurring problem of the connection between chemical structure and specificity of biological action. A further point of interest is that these polypeptide-type antibiotics are all produced by aerobic, spore-forming micro-organisms of the genus *Bacillus*.

Subtilin

Subtilin, one of the polypeptide-type antibiotics first recognised by Salle and Jann (*Proc. Soc. Exp. Biol. Med.*, 1945, *60*, 60), is produced by *B. subtilis* in surface or submerged culture. Subtilin is one of two antibiotics produced by this organism in certain conditions. The second antibiotic so produced is anti-fungal and, so far, has received only preliminary study. Subtilin is said to have an unusually wide antibacterial spectrum and to be especially effective against *Micrococcus conglomeratus*, *Staphylococcus aureus* and *Streptococcus faecalis*.

Production of subtilin has been explored by the U.S. Department of Agriculture as part of a programme for finding new uses for vegetable wastes. In this case asparagus cannery waste liquors are used. It is stated that a large quantity of these liquors are available every year in California (*Dr. and Cos. Ind.*, April, 1947, 479). The technique of the deep fermentation method for production of subtilin is as yet unrevealed, but surface fermentation may be carried out by sterilising asparagus juice medium for 30 minutes, adjusting to *p*H 7.0, cooling, innoculating and fermenting at 35°C. for 8-10 hours. The presence of certain trace metals in the medium is essential; but the deleterious effect of zinc at over 2.0 p.p.m., potassium in excess of 100 p.p.m. and calcium more than 50 p.p.m. may be minimised by addition of citric acid.

Extraction Method

The antibiotic is separated from the fermentation medium by extraction with a mixture of equal volumes of n-butanol and petroleum ether. The alcohol phase, after separation by any further necessary addition of petroleum ether, is extracted with 1 per cent acetic acid and sodium chloride is added to 6 per cent concentration. After washing with solvent the precipitate is dissolved in water, purified by removal of material insoluble in 0.4 per cent sodium chloride at *p*H 4.6, and precipitation of the antibiotic with 10 per cent sodium chloride. By this procedure 30-35 per cent of the antibacterial substance in the culture is recovered.

Subtilin has a low order of subcutaneous toxicity and there is no local irritation when it is injected into mice in a dose near to the median lethal dose.

Subtilin appears to differ from other antibiotics of the polypeptide group by being destroyed by the enzyme trypsin. The potentialities of this drug are not yet fully known, but Florey (*J. Amer. Med. Ass.*, 1947, *135*, 1047) states that it has proved effective in experimental infections in animals with anthrax bacilli and pneumococci.

Bacitracin

Another polypeptide-type antibiotic which is undergoing appraisal is bacitracin which, like subtilin, is produced by a gram-positive spore-former of the *B. subtilis* group. It was first isolated by Johnson *et al.* (*Science*, 1945, *102*, 376). The highest yield of antibiotic is 26 units per ml. on soya bean digest; but more usual titres are 4-8 units *Manuf. Chem.*, 1947, *18*, 307).

Harvesting is 3-4 days after incubation is commenced at *p*H 7.2—8.0 (according to the particular medium used) and 37°C. From the filtered broth the antibiotic is extracted with n-butanol after which the alcohol is removed *in vacuo* in the presence of sufficient water to take up the residue to one-hundredth of the original volume. Purification is achievd with butanol/chloroform mixtures and the ultimate aqueous extract from this solution is freeze-dried.

The preparation is fairly stable, even in solution, at low temperatures over prolonged periods and for short periods at boiling. The degree of stability, however, appears to depend upon the presence or absence of certain impurities. Hydrogen peroxide immediately inactivates bacitracin; BAL (British Anti-Lewisite) and thiosulphate also deactivate.

Anti-bacterial Activity

As with penicillin, heavy metals inactivate bacitracin. The complete range of antibacterial activity has not yet been established; but a preliminary survey shows that, *inter alia*, hæmolytic streptococci, pneumococci, diphtheroids and the pus formers C. *welchii* and C. *Septicum* are sensitive. *E.coli*, *Ps. æruginosa*. *E. typhosus* and, as might, perhaps, be expected, the *B. subtilis* group (among which is the bacitracin producing micro-organism) were resistant.

First clinical successes by topical application of bacitracin have been recorded. It is considered that since it has activity against staphylococci and non-hæmolytic organisms which are resistant to penicillin and sulphonamides its future depends upon proved usefulness in such infections (*J. Amer. Med. Ass.*, 1947, *133*, 675). It is further suggested that, since bacitracin is not inhibited by plasma, blood, pus or broken down tissues it may be useful in mixed bacterial infections.

(To be continued)

American Chemical Notebook

From Our New York Correspondent

DR. PHILIP M. MORSE, director of the Brookhaven National Laboratories, last week told a meeting of the American Physical Society in New York that the city's atomic pile at Brookhaven, Long Island, is expected to be in operation next autumn, and revealed that designs have been completed for a ten billion electron-volt cyclotron, more than 20 times as powerful as any now in existence. At the same meeting, Dr. Robert E. Bacher, of the U.S. Atomic Energy Commission, indicated that peacetime power from the atom may not be so far distant as has been generally stated by physicists. "There will probably be a small-scale production within two years," he said. "While there are many difficulties to be overcome, we look forward to the operation of a large-scale reactor for the practical production of electrical power within, say, ten years." For the time being, Dr. Bacher said, current work on reactors will be centralised near Chicago, Illinois, where a new site for a mammoth laboratory is being acquired. "This move will require some time to carry out," he said, "but it has become clear that reactor development can go forward with the greatest acceleration if it is the main responsibility of a single laboratory." Reporting on the progress of operations going on at Brookhaven laboratories, Dr. Morse indicated that the new pile would be put through extensive low-energy operations, and before preliminary work is finished it will be the "best understood" pile in existence. Pilot studies in biology, chemistry and physics were already in progress, he said, and, with completion of the pile, would lead directly to reactor work.

* * *

Recognition of the need for additional production of channel type carbon black is reflected by the formation of the Witco Hydrocarbon Corporation to process 15 million cu. ft. of natural gas per day from the Barnhart pool in Reagan County, Texas. Two plants are to be constructed. The gasoline plant will produce approximately 2000 barrels of gasoline, butane, and propane per day. The residual gas will be burned in the second plant to make channel carbon black which will be marketed by the Witco Chemical Company. These plants will cost about $3.5 million and should be completed by July, this year. It is contemplated that future developments will include the processing of hydrocarbons into various chemicals needed in industry. The gas to be processed is produced from 48 wells having a daily production averaging 5300 barrels of oil. The site is at Witco, Texas. Mr. Robert I. Wishnick, president of the Witco Chemical Company, heads the new corporation, which will operate the two plants, and Mr. C. E. McKinney is vice-president in charge of operations.

* * *

The 1947 annual report of Hercules Powder Company, Wilmington, Delaware, issued to stockholders this week showed net income after all charges of $12,934,430, and in the words of Charles A. Higgins, president, "1947 was a boom year in which Hercules Powder Company, like most others, set new records for sales and earnings." In 1946, net income of the company was $8,409,843. Sales increased by 30 per cent and $14,500,000 was spent on plant facilities. The report states that the company has almost completed its original post-war programme, and most of the facilities are in operation. The expansion is largely in fields supplying plastic, rayon, protective coatings, and related industries. Export business of the company during the year amounted to $17 million, representing 13 per cent of total sales. Net sales and operating revenues for the year ended December 31, 1947, totalled $131,269,790 as compared with $100,727,567 for 1946.

* * *

Three new members of the Geon 200 series resins have recently been made available by B. F. Goodrich Chemical Company, Cleveland, Ohio. The 200 series, made up of modified polymers of vinyl chloride, has included to date Geon resins 202 and 203. Now Geon resins 204 and 205 are in commercial production with Geon resin 200 × 14 available in experimental quantities. The new materials offer increased thermoplasticity and a lowered softening point and greater solubility. Good solubility, another characteristic possessed by these resins, makes them highly useful in the solution coating field. Geon 205 has been designed as a rigid moulding material requiring no plasticiser. The development of this material has been so directed that it may be used in the moulding of gramophone records. Records moulded from Geon 205 are said to possess an extremely low noise level, good reproduction and durability, and high resistence to breakage. Another interesting application is in the moulding of rigid plastic sheeting for playing cards and advertising novelties. The manufacture of battery separators, industrial lacings, rigid piping, etc., are other possibilities.

Metallurgical Section

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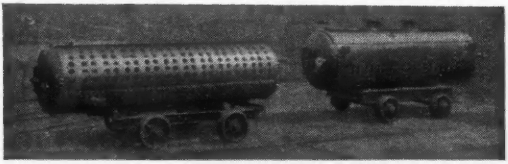

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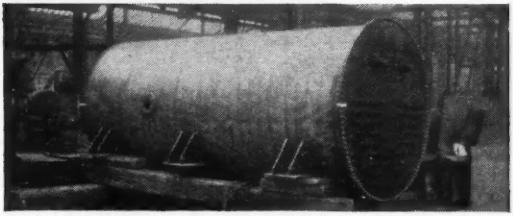

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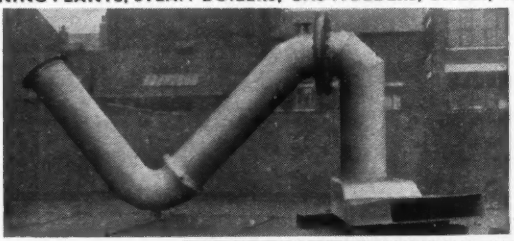

Large Diameter Welded Pipes for Chemical Works

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Group of Mild Steel Pressure Filters

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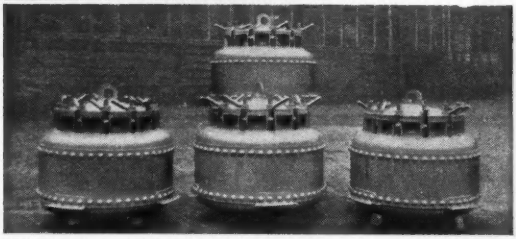

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Metallurgical Section

7 February 1948

METAL CLEANING PROCESSES—I

Factors Determining Methods and Materials

by L. SANDERSON

MORE than ever metallic surfaces are being required perfectly clean, because contamination from dirt, oil, grease, oxides, etc., may prove fatal to processing or invalidate experimental work. The following article and its successors will endeavour to review comprehensively the main features of modern processes for cleaning metals, and will describe the type of plant employed.

The kind of cleaning substance employed is determined by the kind of superfluous material to be eliminated, as well as on the actual character of the metal itself. The method of cleaning adopted depends on the shape of the work, while the kind of equipment used is based on the production rate desired and on the cleaning process.

Three essential features are therefore involved in any cleaning problem: the material, the process, and the equipment and each of these is conditioned by additional factors. For example, the choice of a cleansing agent will be influenced by the condition of the work; by the type and adhesive power of the superfluous matter to be eliminated; and by the degree of cleaning required, as well as by the nature of the metal. Among the factors affecting the choice of equipment will be the kind of finish desired, *e.g.*, wet, dry, hot, or cold; on the degree to which extra operations are incorporated; on the plant at the user's disposal for heating the cleansing solutions; the space available; and the position of the plant in the chain of processes.

Additional points to be considered are the relative aggregate expense of the various cleaning agents, methods and plant.

Selecting Process and Cleanser

The primary consideration here is whether the work is to be done by manual labour or machinery. There are occasions when mechanical cleaning is not economical, and when the production rate desired may justify the purchase of a completely automatic cleaning machine.

Wherever, as frequently happens, the pieces to be dealt with are not thickly filmed with foreign matter, and are capable of being cleaned by methods and cleansers that would not work satisfactorily with thicker or more tenacious coatings, the use of mechanical cleaning may not be essential. The foreign matter may be harder to eliminate if the metal has been subjected to elevated temperatures or pressure in course of processing. There are certain foreign substances that have a harmful influence on the cleaning solutions, and where these substances heavily coat the surfaces concerned, they may be most damaging in their curtailment of the life of these solutions.

Foreign Substances

"Dirt," in the sense in which it is employed in this article, covers all unwanted substances on a metallic surface, and is far too unscientific to be of material aid in discussing individual metal cleaning problems. Certain "dirts" are readily eliminated by a particular cleansing agent and may be untouched by others.

The foreign matter to be removed may be a cutting compound, a lubricant, a coolant, a drawing or stamping lubricant, a polishing or buffing compound. These vary greatly in composition, so that they cannot be satisfactorily described merely as "cutting compound" or "lubricant," when the problem is submitted. The precise composition of the material has to be determined in advance of any sound choice of cleaning solution. If the manufacturer will not reveal it, or if for any other reason it cannot be ascertained, its character must be ascertained in the laboratory.

Sometimes a mass of solid dirt particles are firmly united and kept so by films of grease or oil. Colloidal particles are sometimes adsorbed on the surface of a solid dirt particle, and adhere to a metallic surface.

In factories, a specific method of cleaning that has proved highly satisfactory over a series of years sometimes breaks down suddenly, despite the fact that there has been no alteration in process or solution. When this matter is investigated, it is commonly found that the cause is a modifica-

tion of the lubricant, compound, or other kind of "dirt," so that there are ingredients present that do not respond to the specific method employed.

It is important to note that economically it is advantageous to buy coolants, compounds, etc., and particularly those employed from drawing and stamping, which are capable of being readily and effectively cleaned by the commoner cleansing solutions. The only reasonable exception to this rule is when the benefits of employing a special compound outweigh the simplification gained from using the commoner cleansing agents.

Practically every kind of metallic piece found in the machine and other workshops dealing with metals carries a certain amount of swarf, dust, chippings, oxides, and miscellaneous solid dirt in the form of particles. In addition, many pieces require to be cleaned after they have been in service for some time, so that they may be modified, controlled, or repaired, *e.g.*, by welding or rectification. On the surfaces of these parts will be found "dirts" varying from clotted oil and grease to abrasive materials, sand, mud, tar, and carbonised oils and greases.

Adhesion Factor

The extent to which the film of foreign matter adheres has a marked bearing on the cleaning problem. If there is only a thin film, such as is picked up by a metal casting which has been resting on the moulding shop floor, or has been lying in the grinding shop, where it acquires a layer of dust, this may be blown off quite effectively.

There may, however, be mill-scale or carburised areas on a steel forging. These are very difficult to remove because they are made up of iron oxide and a finely divided form of carbon. The thin dust film could readily be removed by washing or immersing in a tank of suitable solution. The forging would have to be treated by means of specially developed processes and substances. These two instances represent the extremes. There are many intermediate problems.

Whether the cleansing solution is to be alkaline, acid, solvent or emulsifying depends on the tenacity with which the dirt film adheres.

The degree of cleanliness called for may affect the cleansing agent and method adopted. Where the work must be painted or lacquered, the surface is generally required to be quite free from coarse surface dirt. Electroplated work must have all coatings of grease and oil entirely removed to ensure that when the metallic surface is "wetted" by the cleansing agent, no spot of discontinuity of the water film is allowed to occur. Every particle of solid matter must likewise be eliminated so that it does not impede the action of the plating solution. For identical reasons, oxides, scales, stains, etc., must be thoroughly removed.

Certain jobs do not need the maximum degree of cleanliness. When parts have to be assembled, rough painted, or inspected, it is not so necessary to remove every trace of foreign matter as in the processes described above. The solution employed is to some extent influenced by the function of the work, and the solution in its turn determines the design and construction of the mechanical apparatus employed.

Types of Cleansers

The main types of cleansers are (i) alkalis; (ii) degreasing solvents; (iii) petroleum products; (iv) emulsifiers; (v) acids. Usually it is better to keep a specific cleaning machine to a particular cleanser, as this gives better production rate, quality, and economy. Some types of cleaning machines, on the other hand, call for only slight modification to fit them for a different solution.

The next important factor is the effect of the cleaning agents on the kind of metal. Many kinds of "dirt" many degrees of dirtiness, and many degrees of cleanness, immediately indicate an alkali as the best cleansing agent, but in actuality some metals, such as brass, zinc, and aluminium, are unsuitable for alkaline cleaning solutions. This is because they react with the alkali, and under certain conditions may cause a heavy staining or corrosive attack. Emulsifiers are then required, because these do not corrode or stain. Emulsifiers have many advantages and render the kind of metal of minor importance. They may, therefore, be used to good purpose unless the design of the work is such as to make their adoption impracticable.

leaning Methods

While cleaning of metals is very commonly done with alkalis, alkaline cleaning has its disadvantages. Chlorinated solvents for vapour and liquid phase degreasing may be employed on occasion if there is no other practicable process. Petroleum solvents are extensively used for dipping and spraying in those instances where aqueous solutions might rust the work, in the absence of an efficient drying method. Such solvents are, however, not ideal, and their use involves a degree of danger.

Acids are often used to prepare metals for painting and to eliminate grease, scale and rust at the same time. They will also render steel temporarily resistant to atmo-

(*Continued on page 208*)

ABRASION, EROSION AND CORROSION

Progress in the Study of Metal Surfaces

A NUMBER of misapprehensions have long persisted affecting the three most familiar forms of damage to metal surfaces, abrasion, erosion and corrosion. The first two, which at first sight appear to be purely physical actions, have chemical aspects. This was one of the points recalled by Dr. C. H. Desch, F.R.S., lecturing to the Chemical Engineering Group of the Society of Chemical Industry.

References to the rusting of iron, as contrasted with bronze, occurred, he noted, in the earliest industrial literature, and the ancients were impressed with the incorrodibility of silver and gold.

In the sphere of abrasion it was originally thought that polished surfaces were produced by making a series of increasingly fine scratches. Rayleigh and then Beilby showed that in fact surface flow occurred in final polishing, yielding a chemically reactive surface layer. This layer—variously described as amorphous, fine crystalline and vitreous—absorbed foreign atoms in a way which the original crystalline metal could not. Thus the layer had high internal energy.

The rolling of metals on one another produces no damage, but when slip occurs, even if only of a few microns, oxide is produced. In high vacuum no oxide, of course, is produced, and there is little wear with smooth, *different* surfaces. Thus, steel pivots in sapphire give a low coefficient of friction *in vacuo*. Normally, in air, local contact of metals encloses oxygen at high pressure and yields oxide at low temperatures, familiar to engineers as "cocoa."

High Temperatures

Bowden, investigating the sliding of surfaces over one another, found that there was a stick-slip action with intermittent flashes and local high temperatures. With dry constantan on steel 1000°C. was obtained for ten-thousandths of a second. Lubrication with water, or even with oil, reduced but did not eliminate the high temperatures.

Bowden's study of the influence of melting-point of polishing materials revealed that melting-point was much more significant than hardness. Thus, camphor which melts at 176°C. polishes the harder Wood's metal which melts at 65.5°C. Lead oxide, melting at 880°C., polishes speculum, but does not polish higher melting metals. The actual area in contact when polished flat surfaces are put together is about one ten-thousandth of the gross, nominal area. This agrees well with the fact of local high temperatures being attained.

In the examination of surfaces, chemical methods have, in general, been rather neglected. Jacquet, however, in France has obtained some beautiful results using ammonium polysulphide as his etching reagent. Fine scratches, twins, slip bands and crystal orientation were all clearly shown up in distinctive colours.

Protective Processes

That the action of acids on metals is complicated, is clearly evident from the production of etching pits and patterns, rather than uniform solution of the surface. Corrosion is a complicated phenomenon because the nature of the product intervenes. For instance, the impermeable oxide film on stainless steel or passivated iron exhibits further action. This type of protection may be reinforced by building up a magnetic iron oxide protective film or, in a similar way, by phosphating.

Electrolytic polishing avoids distortion of the highly important grain boundaries. By this method copper may be polished in syrupy phosphoric acid; steel may be treated in perchloric acid—acetic anhydride mixture—but the mixture is explosive and must be ice-cooled. The finish, however, is better than that of mechanical polishing.

Severe internal stresses may cause failure of a metal or slight surface corrosion. The attack occurs preferentially at grain boundaries which are anodic to grain interiors. Thus, some cold-worked alloys disintegrate explosively in ferric chloride, while β-brass may be broken down to a sand-like consistency by immersion in mercurous nitrate; caustic cracking of boilers shows the same type of action.

Chemical Engineering Requirements

Chemical engineering in general demands complicated alloys. In the following recently-published Sheffield alloy, all the constituents are claimed to be deliberate and necessary:

2 CO, 1 Si, 1 Mn max., 17-18 Ni, 13-14 Cr, 3-4 Cu, 3-4 Mo, 7 Co, 2.5 V, 0.5-1 Ti.

Ordinary steels may be slightly—but not appreciably—improved by small alloy additions, but no change in the *order* of resistance occurs until the stainless steel compositions are reached. Much modern work on corrosion resistance is consequently along the lines of developing metal surface resistance, in addition, of course, to artificial protective coatings.

Metal Prices Again Increased

Virgin Metal and Copper, Zinc and Brass Scrap

NEW increased prices of zinc and of three categories of non-ferrous scrap metals were announced last week-end by the Ministry of Supply. The scrap metal prices will apply at Ministry of Supply depots at which "the Minister is prepared to effect a sale to a buyer, subject to having sufficient material of that particular quality available at a convenient depot at any particular time." The list refers to delivery within the current and next three calendar months. The schedule of materials, the Ministry points out, may be amended in the light of changing circumstances and prices may be altered in accordance with market conditions, production costs and other factors.

The new schedule to be applied by the Directorate of the N.-F. Metals (Scrap Disposals Department), 2 Hyde Park Street, London, W.2, is as follows:—

	Per ton ex-works £ s. d.
Copper	
Shell band scrap, clean untinned, cut up and copper turnings	124 0 0
Zinc scrap	63 10 0
Zinc alloy die cast scrap	70 0 0
Brass S.A.A.	
Webbing	104 0 0
Defective cups and cases	103 0 0
Cut-offs and trimmings	97 10 0
Muffled and/or mechanically treated cases	100 0 0
Turnings, loose	89 10 0
Q.F. webbing	105 0 0
Q.F. cut-offs and trimmings	103 0 0
Q.F. defective cups and cases	105 0 0
Q.F. turnings	90 10 0
Other 70/30 process and manufacturing scrap	101 10 0
60/40 rod swarf	82 10 0
Process and manufacturing scrap containing over 62 per cent. and up to 68 per cent. copper	96 5 0
Broken down fuze scrap 60/40 and/or 60/40 brass rod of diameter 1½ in. and over	93 0 0
90/10 gilding metal webbing	116 10 0
90/10 gilding metal defective cups and envelopes before filling	114 0 0
Scrap gilding metal bullet envelopes (max. antimonial lead content 4 per cent.) ...	100 10 0
Scrap cupro nickel bullet envelopes (max. antimonial lead content .08 per cent.) ...	116 0 0
Brass cartridge metal strip	106 0 0
Brass scrap 70/30 ingots	106 0 0

New Zinc Rates.—The Control of Non-Ferrous Metals (No. 31) (Copper, Lead and Zinc) Order, 1948, which came into force on January 30, increases the maximum prices of zinc and zinc sheets by £5 a ton and of zinc oxide by £4 5s. a ton. The increases, states the Ministry of Supply, follow the recent rise in the American market price, which affects the Ministry's buying prices for overseas supplies of zinc metal. The Directorate of Non-Ferrous Metals resumed on January 30 the granting of licences for the acquisition of unwrought zinc.

METAL CLEANING PROCESSES (*Continued from page 206*).

spheric corrosion until other more suitable finishes can be applied.

Considering each process individually, it may be said that the alkaline solution emulsifies most greases and oils, is relatively cheap, and is applicable by means of a high pressure spray. Hence, the chemical action of the solution is strengthened by the mechanical action of the high pressure. Modified alkaline cleansing solutions have now largely replaced the caustics formerly used, even for classes of work demanding the greatest degree of alkalinity. The requisite alkalinity is secured by employment of alkaline salts in place of alkalis based on caustic. These are less risky and more pleasant to use, but the fact remains that cleaners of high alkalinity may cause skin injury and burns, though they are less dangerous than the original alkalis.

Selecting alkaline salts for commercial cleaning to-day demands attention not only to the right degree of alkalinity, but also to the ability of the salts to produce, by hydrolysis, additional alkalinity progressively in proportion as the reaction of the solution on the coating reduces the initial alkalinity. This is "buffer action," and it maintains constant alkalinity during the working life of the solution.

Thorough wetting of the surface of the metal is essential to accelerate the penetration of the aggregation of film. A wetting agent should, therefore, be included in the solution, which will produce beneficial results and facilitate rinsing when the operation has been completed.

Simple experiments will indicate the effect of surface tension. A loop of thread can be laid on a film of soap formed in a wire ring. Surface tension will fracture the film inside the loop and draw the loop into a true circle. A needle can be made to rest on water, and will perceptibly depress the surface film without breaking it. A wider concentration range is afforded by a solution having a buffer action.

(*The second article of this series will study in greater detail the alkaline cleaners.*)

Foreign Iron and Steel Progress

Rising Totals Reported from Austria, Sweden and Brazil

LATEST available information about Austria's heavy and metallurgical industries, reveals that output of hard coal in the first eight months of last year amounted to 76 per cent of the 1938 figure, lignite 85 per cent, pig-iron to about 50 per cent, and raw steel to 48 per cent. In examining these figures, it has to be remembered that industrial production in Austria is greatly influenced by seasonal fluctuations chiefly in relation to the coal supply position. Iron-ore production at the famous Erzberg deposits in Styria (British zone) amounted to 78,200 metric tons in May last, while the July steel output at the Donawitz Works aggregated 20,000 tons. Lead and zinc output in Carinthia totalled 20,400 tons in the first half of 1947.

The Radentheim (U.S. zone) works, which exported large quantities of magnesite before the war, has resumed export production, and it is reported that Switzerland is taking 8 per cent out the output.

Statistics published recently in the Austrian *Der Volkswirt*, show that although production of common salt, nitrogenous fertilisers, oil shale, copper-bearing ore, aluminium and electric power is higher than in 1937, there was a severe decline in the output from industries concerned with the manufacture of cellulose and graphite.

Sweden

IN view of the considerable increase in Swedish ore exports during 1947, improved financial results from the leading Swedish ore group Loussavaara-Kirunavaara A.B., which exploits the valuable ore deposits in Swedish Lapland, were firmly anticipated. In fact, profits for the year to September 30, 1947, rose from the 1946 total of 16 million Swedish crowns to 31 million Swedish crowns.

Gross income derived from ore-mining activities rose from 40 to 70 million Swedish crowns, which in view of the almost negligible shipments to the formerly important German market, is regarded as a considerable achievement. Exports to Germany (through the Netherlands) last year aggregated a mere 10,000 metric tons.

No details are given about the total quantity of ore exported but it is estimated at about 5.6. million metric tons, compared with about 3.4 million tons in the previous year. The chief customers were Belgium and Luxembourg, followed by the United Kingdom, the United States, Czechoslovakia, and Poland. Mention must be made to the increasing use of Swedish ores in Sweden itself because of the progress made in the construction of the State-owned iron and steel works in Norrbotten; a ten-year delivery contract is stated to have already been signed between the two companies, to become effective at the beginning of 1950.

Brazil

THE development of Brazil's iron and steel industry during the last decade is the subject of a report recently published by the Brazilian Council of Foreign Trade. Whereas ten years ago, iron and steel bars were the only Brazilian products to find their way to the market, the industry is now in a position to deliver a variety of metal goods, including wire, railway rails and metals for machine tools. The report claims that Brazilian iron and steel compare well with foreign products. In prices, however, Brazilian production cannot compete, for example, with the U.S.A.

Pig-iron production which in 1937 was 98,000 tons, has risen to 369,000 tons, while steel production has increased from 76,000 to 344,000 tons. In the same period tin plate has risen from 71,000 to 232,000 tons. In 1946, the large Volto Redonda iron and steel works started operations, and in the year ended June 22, 1947, it produced 96,000 tons of pig iron. In 1937, there were six pig-iron producers, of which the most important was Cia. Siderurgica Belgo-Mineira. This concern was still the largest producer in 1946, being responsible for some 30 per cent of the country's output. It is assumed, however, that the new Volto Redondo Works will eventually assume the leading rôle.

The tin-plate industry has also enjoyed considerable expansion, the four concerns engaged in 1937 having grown to 14 by 1946. In this field the already-mentioned Cia. Siderurgica Belgo-Mineira is the leading manufacturer with an output of 105,000 tons, a position which it is thought this company will maintain.

Burma Finds Uranium.—Deposits of both uranium and of thorium are reported to have been discovered in Central and Eastern Burma. Large quantities are said to exist in the Yingyan district of central Burma where the Burma Oil Company's fields are located. According to Dr. Hla, secretary of the Council of Burma Industries, who made a geological survey of the country, the frontier areas of Burma are very rich in rare metals, especially in platinum.

German Refining Processes

Exploratory Work on Aluminium

A FURTHER report published for the Office of Technical Services of the U.S. Department of Commerce, Washington, prepared by Major William C. Aitkenhead, U.S. Army, is a useful addition to what has already been published on aluminium refining in Germany, with particular reference to processes which are still in the laboratory or pilot-plant stage.

This report, the fifth published by the Office of Technical Services on the subject, states that German research had been directed to the refining of large quantities of secondary metal derived from scrap aeroplanes as well as to the refining of electrothermically manufactured aluminium/silicon alloys. Had this second aim been reached, Germany might have reduced her bauxite imports by substituting clay for bauxite.

Four Processes

The author of this report divides German aluminium refining processes used, or proposed to be used, into four classes. To the first class belong the Beck magnesium process, the Walther Schmidt mercury process, the Fondaminski zinc process, the Kirsebom lead process and the Ginsberg or de Thierry manganese process. They involve the dissolution of aluminium in, or the treatment with, another metal, followed by liquidation ore filtration and the removal of the purifying metal by distillation or other known means.

The magnesium process was the only one of these to be used on a commercial scale (by I. G. Farbenindustrie at Bitterfeld), and the mercury process was on trial by the Walther Schmidt Leichtmetallhütte, near Leipzig. Both the magnesium and the mercury process are described in the four previously published reports, viz., PB-44678, PB-31593, PB-4280 and PB-23188.

Other Metals

The report under review also gives data on the zinc, lead and manganese processes which were being developed and tested by the well-known Vereinigte Aluminium Werke. There is, furthermore, information on German research to develop a method for disintegrating aluminium scrap in which the iron is removed by physical means and the zinc by oxidation.

The three layer-electrolytic refining processes (class four), according to the author, have undergone some development both in Germany and in Italy during the war. A description of the processes as used at two German plants is given in the above-mentioned report, PB-44678, and the present report briefly describes Italian practice.

U.S. Powder Metallurgy

Over 2000 Patents Since 1847

ON January 1 last year 2253 patents for processes in powder metallurgy had been registered in the U.S.A. Some of them were a century old. That revealing indication of the highly elaborated development of metal powder technology in America is presented in Report PB 81841 of the U.S. Department of Commerce, which represents a remarkably comprehensive study of the subject and of merits and disadvantages. It points out that maintenance of close tolerances, shorter manufacturing time, less scrap waste, and higher production rates are among the advantages to be gained by using these techniques for making metal parts. The fabrication of parts from metal powders involves the compaction or "briquetting" of metal powders into moulds under pressure followed by "sintering" or heat-treating the briquette to produce the finished article. Certain drawbacks are listed, including the following: Equipment required is costly; great skill and experience are necessary; very close production control is essential; metal powder raw materials are expensive; parts produced by other methods are more easily machined; tool and die costs are high; since powder metals do not "flow" the design and size of parts is limited; special problems arise in plating powder metal parts because their porosity permits absorption of liquids or salts in plating solutions.

Practically all industrial metals may be used in powder form, the report states, and some of the important metals—columbium, tantalum, tungsten, molybdenum—are reduced from ores in powdered form to begin with. Powder metallurgy can produce duplex alloys which retain the individual characteristics and properties of each constituent metal. Such combinations are particularly important in the electrical industry for making electric contacts, electrodes, copper-graphite and copper-silver motor brushes, and various other products.

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Technical Publications

SOME of the widely ranging activities of Johnson, Matthey & Co., Ltd., in the sphere of chemistry of precious metals, with which the firm has been intimately concerned since 1822, is reflected in the publication "Chemical Compounds of the Precious and Other Metals" which the firm has just issued. Principally, this is a useful reference to the many rare metals and metallic salts which Johnson, Matthey handles, supplying all the basic information required and acceptable information is given about highly purified metals, such as copper refined to 99.999 per cent purity, for use as reference standards in quantitative spectrography. The company maintains in its own research laboratories a continuous study of the chemical, physical and mechanical properties of all those metals and alloys in which it specialises, and is making an important contribution towards the solution of new problems and facilitating the satisfactory execution of fresh demands when they arise.

* * *

One of the latest machines designed and built by the electrical engineer is the particle accelerator of nuclear physics—the betatron. Preliminary tests have already been carried out on such a machine, which has been built in the British Thomson-Houston Company's research laboratory during the past year. It departs from established designs in two ways. First, the A.C. magnetic field which serves to guide and focus electrons in a circular path is quite separate from the A.C. magnetic field which accelerates the electrons. The second departure is a logical consequence of the first and involves the use of a relatively small-bore evacuated tube (toroid or doughnut) in which acceleration takes place. During the course of this acceleration, the electrons have to circulate over a million times, and travel something like 850 miles in this narrow tube without hitting the walls. The betatron is intended for outputs ranging from 10 to 15 Mev. and will be used by Lord Cherwell at the Clarendon Laboratory, Oxford. This and other matters of scientific interest are discussed in a report on the work of the British Thomson-Houston research laboratory in 1947, which is now available.

* * *

Among the numerous organisations which could claim to have played a prominent rôle in the advancement of British scientific achievement, which in the last 25 years has received accelerating impetus from two world wars, the Scientific Instrument Manufacturers' Association deserves special mention. There are some famous names on the list of member firms, names that command respect internationally in industry and in the educational institutions. Upon the high quality, accuracy and reliability of British laboratory and research apparatus have depended many of the scientific discoveries of the last century. It is fitting, therefore, that Sir Edward Appleton should intimately associate himself with the S.I.M.A. by recording a personal message to members in the first post-war edition of the association's handbook (for 1947), just published.

To all who are concerned with the manufacture of commodities that owe their existence to research and development in the fields of physics and chemistry—and there can be few to which this will not apply—the list of firms supplying dependable equipment and apparatus is indispensable. Ready accessibility by means of comprehensive indexing and referencing, which is not always a feature of trade handbooks, added to this book's value. The work of various sections of the association is admirably described and illustrated in the first part of the book. The 1947 Handbook can be obtained from the association at 26 Russell Square, W.C.1. (10s. 6d. post free).

* * *

A super-agitating and conditioning machine is the subject of a 15-page booklet published by the Denver Equipment Co., of Denver, Colorado. Suitable for continuous or batch operation, the machine is supplied in twelve sizes. The literature is amply illustrated, and concise information is enhanced by the inclusion of pulp density tables. A careful study of this booklet will be well worth while.

* * *

Among the many useful organisations whose efforts can assist the economic recovery of the country is, the British Road Federation. This body, which since its foundation in 1932 has sought unremittingly to further and promote the welfare of road transport in all its aspects, has produced a timely pamphlet entitled "What is the B.R.F.?" It not only effectively answers that question but points out the inadequacy of the British highway system and suggests remedies. Copies of the publication are obtainable from the Federation's offices, 4a Bloomsbury Square, W.C.1, free of charge.

Home News Items

U.K. Fat Exports in 1947.—Exports of fats from the U.K. in 1947, including margarine, edible and other refined oils, lard compounds and cooking fats, totalled 13,400 tons.

Glue and Gelatine Control.—The Licensing Section under the Control of Glue, Gelatine and Size (No. 3) Order, 1946, has moved from I.C. House, Millbank, to Horseferry House (Room 723B) Dean Ryle Street, S.W.1. Tel: VICtoria 6800.

Corporation Fined for River Pollution.—Hereford Corporation were fined £25 with 100 guinea costs at Hereford magistrates court last week on a charge of allowing liquid matter injurious to fish to pass into the River Wye. It was reported that 276 salmon were killed.

Duty on Light Oils.—Sir Stafford Cripps and other M.P's have received a report from twelve national trade organisations, which sets out a case for a repeal of the 9d. per gallon duty on light hydrocarbon oils used in the paint, rubber and printing ink industries.

Government Contract for Mullard's.—The Government has placed an order with the Mullard Wireless Service Co., Ltd., for 400,000 valves for use in the state-sponsored hearing-aid, which is to be made available to all persons suffering from defective hearing when the National Health Service Act comes into operation in July.

Mining Engineering Exams. — Annual examinations for certified studentship in mining engineering, and mechanical engineering, will be held in the King's Hall, King's College, Barras Bridge, Newcastle-on-Tyne, on April 15. Forms of application (obtainable from the Hon. Secretary, Institute Board for Examinations, Neville Hall, Newcastle-on-Tyne 1) must be submitted not later than March 18.

Water for I.C.I. Scottish Works.—Representatives of Grangemouth Town Council and the Stirlingshire and Falkirk Water Board have discussed with Mr. J. J. Robertson, M.P., Joint Parliamentary Under-Secretary of State for Scotland, the provision of an additional supply of water to meet immediate demands from the I.C.I. works (Scottish Dyes) at Grangemouth. It has been agreed to supply this extra water, which will form part of the 2.5 million gallons per day, to which the Town Council are entitled under a 1935 Local Act of the Water Board. A working party is to examine the long-term industrial needs of this area.

Cement Prices Up.—An increase of 1s. per ton in the maximum delivered selling prices of ordinary and rapid hardening Portland cement has been authorised by the Ministry of Works. The new prices applied to all despatches as from January 7.

3-Shift System for British Celanese.—A three-shift system has been started in the plastics department of British Celanese, Ltd., Wrexham Trading Estate. About 150 workers are manufacturing plastic powder and bobbins, while another 350 are employed on warp-knitting. The company recently acquired 70 recruits.

Coal Production Rises.—Coal production last week rose to 4,123,300 tons (compared with 4,095,200 tons the week before) but was still rather below the level reached before Christmas. Total output for the first four weeks of this year is, however, approximately 1 million tons more than in the same period of 1947.

Peat Insulation.—The Peat Industrial Research (Scotland), Ltd., writes to point out the most suitable peats for insulation purposes are from a moss of sphagnum peat in Lanarkshire. Granular rather than fibrous, its development in connection with hot water heaters has led to a current economy of 30 per cent and over in comparison with the use of granulated cork.

Radio-Telegraph Service.—Radio-telegraph communication between this country and ships at sea is maintained through thirteen Post Office wireless stations situated at convenient points around the coasts of the British Isles, and through these stations messages can be sent to or received from ships in any part of the world. Inquiries should be addressed to G.P.O. Headquarters, London, E.C.1.

Murex Offers Titanium Hydride

Murex, Ltd., has announced that it is now producing titanium hydride, one of the relatively rare metallurgical products for which there is a small but specialised demand in the fields of powder metallurgy and the radio valve industry. The company says it is the only U.K. producer at the present time. Titanium content is stated to be 98 per cent.

It is estimated that pre-war imports of titanium hydride from the U.S.A. were approximately 4-5 cwt. per year. The company anticipates, however, that demands for research and manufacturing purposes are likely to increase, especially if supplies can be obtained without use of dollars.

PERSONAL

MR. H. E. ALCOCK, governing director of Alcock (Peroxide) Ltd., has been elected president of the Luton and District Chamber of Commerce.

Mr. C. H. Greenewalt, who, as announced last week, has succeeded Mr. Lammont du Pont to become the tenth president of the Du Pont organisation

PROF. J. R. MATTHEWS, of the University of Aberdeen, has been unanimously elected chairman of the Macaulay Institute for Soil Research, in succession to SIR ROBERT GREIG, who died recently.

MR. T. A. MCKENNA has been appointed managing director of the Staveley Coal & Iron Co., Ltd., in succession to the late Mr. H. H. Berresford. MR. S. N. TURNER has been appointed a deputy managing director.

MR. KENNETH MARSHALL has relinquished his appointment as chief of the Export Assistance Department at the National Union of Manufacturers to become director of the Joint Iron Council.

The Royal Netherlands Government has conferred upon SIR GEORGE BEHARRELL, chairman of the Dunlop Rubber Company, the decoration of Commander in the Order of Orange Nassau in recognition of assistance given to the Netherlands during the war and the difficult period of reconstruction.

Chemist's Bequests to University

DR. ROBERT SELBY MORRELL, of Wolverhampton, late principal research chemist at Mander Bros. Paint Works and a former Fellow of Gonville and Caius College, Cambridge, left £52,590. After provision for a number of legacies, he left one-fourth of the residue to his colleges, and the residue to Cambridge University for the advancement of teaching and research in organic chemistry.

MR. R. MURRAY has been appointed managing director of Lewis Berger (Scotland), Ltd., with effect from March 1 next.

Research Chemist becomes Director

At a meeting last week of the board of Monsanto Chemicals, Ltd., DR. W. D. SCOTT, head of the department of research and development, was appointed a director. Dr. Scott joined Monsanto as a research

Dr. W. D. Scott

chemist in 1936 and, a year later, was given responsibility for the technical development and technical services. After three years as superintendent of Monsanto's phthalic anhydride and benzoate plants at Ruabon, Dr. Scott was in 1942 appointed chief chemist of the research and patents activities.

The British Barytes Producers' Association has elected the following officers: Chairman, MR. L. P. O'BRIEN (B. Laporte, Ltd.); vice-chairman, MR. D. W. J. ORR (Anglo-Austral Mines, Ltd.); treasurer and hon. consultant, MR. ALEXANDER REID; hon. auditor, MR. S. KEY (Hopton Mining Co., Ltd.); secretary, MR. R. MURDIN DRAKE.

Obituary

The death is announced of MR. K. B. QUINAN, C.H., whose organisational ability in the early stages of the 1914-18 war was the greatest individual contribution in creating Britain's chemical explosives industry. A young American chemical engineer of exceptional ability, he was recruited from the De Beers organisation in South Africa in 1914 and quickly set in motion new plant for the production of TNT and designed and put in production the key plant at Queensferry. Among his assistants were the present president of the Chemical Society (Prof. C. N. Hinshelwood) and Sir Stafford Cripps. For his services he was awarded the newly instituted Companionship of Honour.

Overseas News Items

France to get all Saar Coal.—Britain and the U.S.A. have agreed that as from the spring of 1949, all coal from the Saar will go to France.

Norwegian Ilmenite Expansion.—For the second time since the war, the National Lead Company, an American concern, has decided to expand the ilmenite-producing capacity of its Norwegian mine. The material will be used for the manufacture of titanium dioxide in the United States.

Palestine Chemical Exports.—Palestine's exports of chemicals rose in the first half of 1947 to £P934,672, an increase over the corresponding period of 1946 of more than £P288,000. Exports of manufactured fats and waxes rose even more sharply to £P2,638,371 (£P1,444,641) and overseas trade in seeds, beans and nuts at £P4,341,742 showed an increase of nearly £P1 million.

Swedish Company's German Purchase.—The A.G.A. Gas Accumulator Co., Stockholm, has purchased the German-owned Tudor Works, at a cost of 4,332,000 kronor. A further 125,000 kronor have been paid for certain German-owned Swedish patents and trademarks used by Tudor. AGA has also agreed to settle Tudor's debts in Germany, totalling some 1,225,000 kronor.

Venezuelan Petroleum for Argentina?—It is reported that a deputy of the Argentine Minister of Industry and Trade, Senor Savino, has gone to Venezuela to continue the trade negotiations which commenced recently in Buenos Aires. It has been stated that in the next few years Argentina hopes to purchase from Venezuela some two million tons of petroleum annually in exchange for dairy products as well as certain manufactured goods. Senor Savino is reported to have stated that consequent upon Argentina's Five-Year Plan, oil requirements are continuously increasing. Her own oil output had been inadequate for some time.

Hydrocarbons from Tomato Parings.—An original process for extraction of aromatic hydrocarbons from tomato parings has recently been patented in Italy by Mr. Adolph Fossataro. Tomato parings are rich in hydrocarbons and their distillation temperature (400° C.) is very low in comparison with that of oil (1400° C.). Distillation takes place in an apparatus equipped with a condensation cooler from which a complete mixture of hydrocarbons and other materials is obtained. A second distillation yields 5 or 6 per cent of benzol, 10-12 per cent of products consisting mostly of turpentine essence, and a high percentage of heavy oils.

British Guiana Bauxite.—Exports of bauxite from British Guiana for the period January 1 to October 31, 1947, amounted to 1,092,672 tons ($5,653,870). Canada took 938,120 tons and the remainder was shipped to the U.S.A. (131,722 tons), and the U.K. (22,830 tons).

Nylon in Engineering.—Two U.S. manufacturers of nuts and bolts—the Elastic Stop Nut Corporation, (Union, New Jersey) and the Nylock Corporation (New York City)—are producing self-locking nuts incorporating the use of Du Pont nylon. The nylon is stated to be bonded within the metal nut, so that it grips the thread of the inserted bolt and prevents loosening.

Austrian Aluminium Works.—The Ranshofen Aluminium Works, Ranshofen, Austria, is reported to be planning to resume operations in the middle of the current year, following their suspension last September. France has undertaken to supply 12,000-18,000 tons of bauxite, for which she is to receive about 40 per cent of the aluminium made at Ranshofen.

New Chemical Preservative.—A solution containing small quantities or sodium benzoate and chloramine T, and including sodium chloride and other chemicals is being marketed in the U.S.A. as a food preservative. Fish and other foods are said to have been preserved for considerable periods without the need for washing and without detriment to taste.

Russo-Swedish Trade Pact Revised.—Russia's postwar trade pact with Sweden which provided for an annual exchange of goods to the approximate value of 100 million Kr., has not reached that figure. A revised schedule has now been agreed upon involving an exchange of goods to the value of 30 million Kr., Sweden to supply iron, steel, ball-bearings, tungsten wire, machinery, and breeding cattle, and Russia manganese and chromium ore, apatite, asbestos and other goods.

Australia Offers Rewards for Uranium.—Rewards ranging from £1000 upwards have been offered by the Australian Government for the discovery of substantial deposits of uranium-containing ores. A further £2000 will be paid for the discovery of occurrences from which 25 tons of uranium oxide can be produced with corresponding payments for quantities exceeding 25 tons. The chief Australian areas for investigation are the West Coast (thorium), Southern Australia (uranium), and Western Australia for both elements.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—allowed by the date of the Summary, but such total may have been reduced.)

WINDMILL RUBBER & CHEMICAL CO., LTD., Denton (Lancs.). (M., 7/2/48.) January 7, £3000 debentures; general charge. *Nil. December 25, 1946.

BRITISH DRUG HOUSES, LTD., London, N. (M., 7/2/48.) January 6, charge, to Williams Deacon's Bank Ltd. securing all moneys due or to become due to the Bank; charged on 222 Kensal Road, Kensington. *Nil. July 25, 1947.

C. BAKER OF HOLBORN LTD., London, W.C., scientific instrument makers. (M., 7/2/48.) December 29, charge, to Westminster Bank Ltd., securing all moneys due or to become due to the Bank; charged on 244 High Holborn, W.C.

Satisfactions

WHITEHEAD IRON & STEEL CO. LTD. Newport (Mon.). (M.S., 7/2/48.) Satisfaction January 8, of debenture stock registered August 25, 1932, to the extent of £8700.

WILLIAM RANSOM & SON LTD., Hitchin, manufacturing chemists. (M.S., 7/2/48.) Satisfaction January 7, of debentures registered January 14, 1928, to the extent of £1000.

BRITISH CELANESE LTD., London, W. (M.S., 7/2/48.) Satisfaction January 7, of debenture stock registered October 2, 1943, and November 8, 1944, to the extent of £40,655.

Company News

The name of **R. E. Nicholas (Romsey, Hants.), Ltd.,** manufacturers of medicines, ointments, chemical preparations, etc., 42 Hampstead Road, London, N.W.1, has been changed to R. E. Nicholas (Romsey), Ltd., as from January 12, 1948.

London Aluminium Co. announces a final payment of 75 per cent share dividend, making 100 per cent for 1947. This compares with total payments of 20 per cent for the previous year. Profit, before taxation, rose from £124,261 to £296,573.

Barclay & Sons, manufacturing chemists, has received an offer to purchase all the issued preference and ordinary shares of £1 at 35s. per share. The offer is conditional upon acceptance before February 10 in respect of 75 per cent of the issued shares.

British Chemicals and Biologicals, Ltd.—Final dividend for the period August 26, 1946, to June 1947 of 4 per cent on the £1 million ordinary stock, making a total of 8 per cent on the ordinary stock and shares in addition to 2 per cent paid on the ordinary shares issued during the year. Net income was £53,511.

The nominal capital of **G. C. Wakefield and Co., Ltd.,** oil refiners, manufacturers of lubricating oils, etc., 46 Grosvenor Street, London, W.1, has been increased beyond the registered capital of £284,375, by £2,000,000 in 4 per cent cumulative redeemable first preference shares of £1 each. The issue will be devoted in part to finance the construction of new plant and storage facilities at Stanlow, Ches.

New Companies Registered

Rochdale Chemical Co., Ltd. (448,611).—Private company. Capital £5000. Makers of soap, oils, chemicals, etc. Directors: J. Taylor, and Thos. Barrow. Reg. office: Mabel Mill, Eafield Road, Smithy Bridge, Littleborough, Lancs.

Scirema, Ltd. (448,547).—Private company. Capital £5000. Manufacturers of chemicals, drugs, medicines, pharmaceutical supplies, paints, colours, oils, etc. Permanent director is Dr. Stephen Rath. Reg. office: 156 Charing Cross Road, W.C.2.

Barcon, Ltd. (26,067).—Private company. Capital £1000. Manufacturers of chemicals, gases, drugs, medicines, etc. Subscribers: A. M. Barclay, Wm. A. Connor, and T. M. Barclay. Secretary: A. M. Barclay. Reg. office: 15 Clencarthill Road, Rutherglen, Lanark.

Wirwick, Ltd. (448,625).—Private company. Capital £1000. Manufacturers of chemical preparations of all kinds for reducing odours and for the treatment and conditioning of air, antiseptics and disinfectants, etc. Directors: P. F. Keens and Chas. R. H. Firth. Reg. office: Bilbao House, New Broad Street, E.C.2.

Prices of British Chemical Products

CONDITIONS in the industrial chemicals market have shown little change during the week. Movements to the chief consuming industries of the more important of the soda products have been satisfactory, relative to the supply position, and a fair amount of new business has been forthcoming for items enjoying a more fluid position. The overall inquiry for export remains substantial and bookings are reported to be good, although no small part of the overseas inquiry is for chemical items which are scarce at present. In the coal-tar products market conditions remain tight and there is little scope for new business. Pitch is a good market and provides the only really active export market in this section.

MANCHESTER.—Prices maintain a very firm front in virtually all sections of the Manchester chemical market, but recent advances seem to have had no effect on the demand. The past week has witnessed a steady flow of inquiries from home consumers of soda ash and other alkali products, and there has been a full absorption of offers of the potash chemicals, with plenty of business passing in a wide range of other materials. Delivery specifications from the textile and other using trades are flowing in regularly. Export demand during the past few days has been fairly active. There is pressure for supplies of most of the fertiliser materials, while the tar products, both light and heavy, are meeting with a persistent inquiry.

GLASGOW.—In the Scottish chemical market business level has been well maintained during the week. The heavy demand from the textile and paint industries has been noteworthy. The demand for the precipitated chalk, B.P. has been heavier than usual and the delivery position is not now so good. Demand for all grades of calcium carbonate has also been heavy. In the export market a number of orders are held up pending the signing of the trade agreement with Denmark. Orders from Hungary have been more satisfactory as that country has a certain amount of sterling available at the present. Inquiries from other countries have been on the usual scale and a number of satisfactory orders have been received.

Price Changes

Rises: Sodium metasilicate and zinc oxide.
Reduction: Salicylic acid.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton, £56 10s.; 80% pure, 1 ton, £58 10s.; commercial glacial 1 ton £70; delivered buyers' premises in returnable barrels: £4 10s. per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 1/5 tons, £86 10s.; single drums, £87 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alum.—Loose lump, £16 per ton. f.o.r. MANCHESTER: £16 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate. — MANCHESTER: £41 per ton d/d.

Ammonium Carbonate.—£42 per ton d/d in 5-cwt. casks. MANCHESTER: Powder, £43 d/d.

Ammonium Chloride. — Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Antimony Oxide.—£162 10s. per ton.

Arsenic.—Per ton, £40 5s. to £41 5s., according to quality, ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £25 15s. per ton, bag packing, ex works.

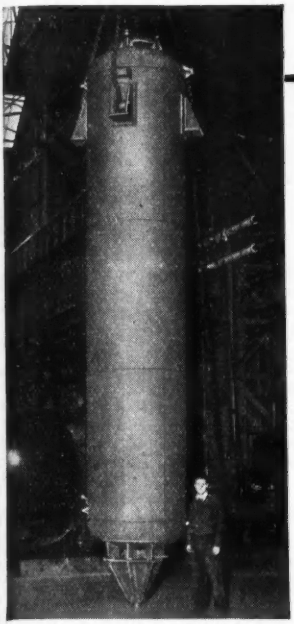
Barium Chloride.—98/100% prime white crystals, 5-ton lots, £26 per ton, bag packing, ex works.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £26 10s. per ton d/d; 2-ton lots, £26 15s. per ton.

Bleaching Powder.—Spot, 35/37%, £11 to £11 10s. per ton in casks, special terms for contract.

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £30; crystals, £31; powdered, £31 10s.; extra fine powder, £32 10s. B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £52; crystals, £53; powdered, £54; extra fine powder, £56. B.P., crystals, £61; powder, £62; extra fine, £64.



Bamag High Pressure Fat Splitting Autoclave

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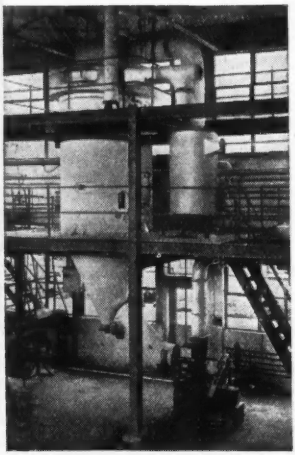
Bamag Spray Drying Plant



Bamag-Weckers Continuous De-acidification of Vegetable and Marine Oils of high F.F.A. content

Bamag-Weckers Continuous Distillation of Fatty Acids

Concentration of Soaplyes and Glycerine Water

Continuous High Vacuum Glycerine Distillation

Fatty Alcohol Production from Sperm Oil

High Pressure Fat Splitting

Hydrogenation of Fatty Oils and Acids by the Bamag Nickel Formate Process

Refining of Oils and Fats

Spray Drying of Soap Powders and other detergents

Sulphonation of Fatty Oils and Alcohols

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Telephone: SLOane 9282. Cables: Bamag, London

BI032-C

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £5 15s. per ton, ex store.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£23 per ton, d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 5⅝d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Copper Carbonate.—MANCHESTER: 1s. 8d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Sulphate.—£42 10s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., from 201s. to 205s. per cwt. lots, d/d.

Formaldehyde.—£28 to £29 per ton in casks, according to quantity, d/d. MANCHESTER: £30 10s.

Formic Acid.—85%, £55 per ton for ton lots, carriage paid.

Glycerine.—Chemically pure, double distilled 1260 s.g., 123/1 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s. 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—10½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Lactic Acid.—Pale tech., £70 per ton; dark tech., £60 per ton ex works; barrels returnable.

Lead Acetate.—White, 110s. to 115s. per cwt., according to quantity.

Lead Nitrate.—About £115 per ton d/d in casks. MANCHESTER: £115.

Lead, Red.—Basic prices per ton: Genuine dry red lead, £106; orange lead, £118. Ground in oil: Red, £132; orange, £144. Ready-mixed lead paint: Red, £140; orange, £152 (subject to increase of £1 10s. per ton).

Lead, White.—Dry English, in 8-cwt. casks, £119 per ton. Ground in oil, English, in 5-cwt. casks, £143 per ton.

Litharge.—£103 10s. to £106 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £18 5s.

Magnesium Chloride.—Solid (ex wharf), £27 10s. per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., for 2-cwt. lots, 7s. 6d.; smaller quantities dearer.

Mercurous Chloride.—8s. 10d. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 4s. 4d. per gal.; pyridinised 64° O.P. 100 gals., 4s. 5d. per gal.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£110 to £121 per ton packed in free 5-cwt. casks. MANCHESTER: £5 10s. per cwt.

Paraffin Wax.—Nominal.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9¾d. per lb.; ground, 10¾d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Iodide.—B.P., 8s. 8d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 8½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 8d. per lb.; technical, £7 14s. 3d. to £8 6s. 3d. per cwt., according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 1s. 10d. to 3s. 1d. per lb. d/d.

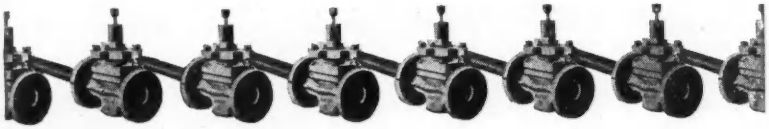
Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

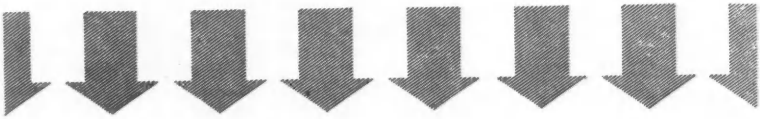
Sodium Acetate.—£42 per ton, ex wharf.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £28 7s. 6d. per ton d/d in 2 ton lots for home trade.





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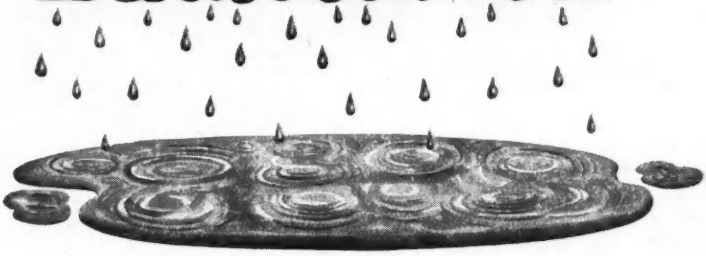

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Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£45 to £47 per ton.

Sodium Hyposulphite.—Pea crystals 22s. 6d. per cwt. (2-ton lots); commercial, 1-ton lots, £17 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., for not less than 28 lb., 10s. 2d. per lb.

Sodium Metaphosphate (Calgon).—11d. per lb. d/d.

Sodium Metasilicate.—£19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrite.—£22 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 11s. 9d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £30 10s. per ton d/d for ton lots. Tri-sodium, £35 per ton d/d for ton lots (crystalline).

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. Spot £4 11s. per ton d/d station in bulk. MANCHESTER: £4 15s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £23 per ton, d/d, in drums; broken, £23 15s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £20 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £14 12s. 6d. to £16 17s. 6d., according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. 8d. to £7 2s. 8d. per ton; 140° Tw., arsenic-free, £4 15s. per ton; 140° Tw., arsenious, £4 7s. 6d. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt., for 10 cwt. or more, £15 8s.; 5 to 10 cwt., £15 9s. 6d.; 2 to 5 cwt., £15 11s.; 1 to 2 cwt., £15 13s. Less than 1 cwt., 3s. 1d. to 3s. 3d. per lb. d/d, according to quantity.

Tin Oxide.—1-cwt. lots d/d £25 10s.

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £75 10s.; green seal, £74 10s.; red seal, £73.

Zinc Sulphate.—No quotation.

Rubber Chemicals

Antimony Sulphide.—Golden, 3s. to 4s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 3s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb, according to packing.

Carbon Tetrachloride.—£50 10s. to £53 10s. per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10½d. to 1s. per lb.

Lithopone.—30%, £32 17s. 6d. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Phosphate.—Not quoted—temporarily unobtainable.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in January, £10 5s., rising by 1s. 6d. per ton per month to March, 1948.

Calcium Cyanamide.—Nominal; supplies very scanty.

Concentrated Fertilisers. — Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £14 18s. 6d.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £17 5s. per ton; granulated, over 98%, £16 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8½d.; nitration grade, 2s. 10½d.

Carbolic Acid. — Crystals, 11½d. per lb. Crude, 60's, 3s. 6d. to 4s. MANCHESTER: Crystals, 9½d. to 11½d. per lb., d/d; crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 97%, 3s. 6d. per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 4s. 4d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Napthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 75s. to 80s. per ton f.o.r. suppliers' works; ex-

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port trade, £7 10s. per ton f.o.b. suppliers' port. MANCHESTER: 77s. 6d. f.o.r.

Pyridine.—90/140°, 18s. per gal.; 90/160°, 14s. MANCHESTER: 15s. to 18s. 6d. per gal.

Toluol.—Pure, 3s. 2½d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2½d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d. per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

***m*-Cresol** 98/100%.—Nominal.

***o*-Cresol** 30/31° C.—Nominal.

***p*-Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

***p*-Nitraniline.**—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

***o*-Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

***p*-Toluidine.**—2s. 2d. per lb., in casks.

***m*-Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON.—February 4. For the period ending February 28, 1948. Per ton, naked, ex mill, works or refinery, and subject to additional charges according to package; LINSEED OIL, crude, £200. RAPESEED OIL, crude, £109; washed £112. COCONUT OIL, crude, £106 refined deodorised, £112; refined hardened deodorised, £116. PALM KERNEL OIL, crude, £105 10s., refined deodorised, £112; refined hardened deodorised, £116. PALM OIL (per ton c.i.f.), in returnable casks, £99 5s.; in drums on loan, £98 15s., in bulk, £97 15s. GROUNDNUT OIL, crude, £110 10s.; refined deodorised, £114, refined hardened deodorised, £118. WHALE OIL, refined hardened, 42 deg., £117; refined hardened, 46/48 deg., £118. ACID OILS, Groundnut, £94; soya, £92; coconut and palm-kernel, £97 10s. ROSIN: Wood, 40s. 6d. to 48s.; gum, 56s. to 62s. 6d. per cwt., ex store, according to grade. TURPENTINE, American, 87s. per cwt. in drums or barrels, as imported (controlled price).

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COLOURS—Mineral, various
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EMERY GRAINS
GLAUBER SALTS
GRAPHITE
HERBS—Culinary
LICORICE—Root and Extract
MAGNESITE
MANGANESE PEROXIDE
MARBLE—Chippings and flour
MENTHOL
QUARTZ—Chippings and Flour
RED OXIDE (Spanish)
SANDS—Coloured
SANDS—Dried and Graded
SILICA (Flour)
SPAR CHIPPINGS
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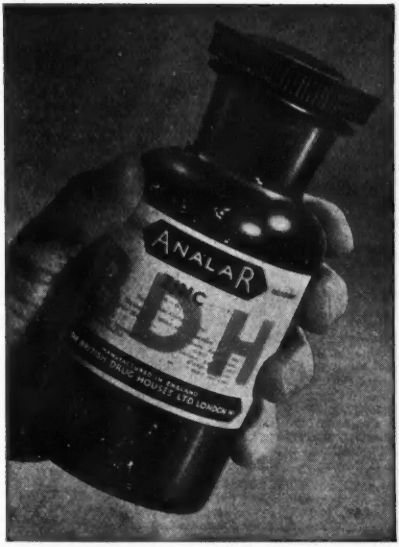

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SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order.

ANALYTICAL CHEMIST required for works in East London area. Experience in the analysis of non-ferrous metals necessary. B.Sc. or equivalent degree, and age about 30 preferred. Reply Box No. 2593, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4, stating approximate salary.

CHEMIST required for research on hydrocarbon oils and gases, also for control of purity and other properties and for work on combustion of the same. Newly established laboratory, London area. Salary according to experience, minimum £600, pensionable. Apply giving full particulars of qualifications and experience. Box No. 2594, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

CHIEF Chemical Buyer (industrial and pharmaceutical) required, fully experienced in export markets. Capable of handling expanding business of city firm. Write, stating salary required, together with fullest information of past experience to Box No. 2588. THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

PLANT Chemists urgently required for Process Plant Operation by large company operating in the Middle East. Applicants need not be Graduates but should have had a chemical training up to Inter. B.Sc. or National Certificate Standard with experience of shift work in either a gas, coke oven or chemical works. Age not over 30. Salary in sterling between £540 and £600 per annum, plus generous allowances in local currency, with free furnished bachelor accommodation, passages out and home, medical attention, also kit allowance and Provident Fund benefits. Apply, stating age, qualifications and experience, etc., to Dept. F.22, Box 1021, at 191, Gresham House, E.C.2.

SITUATIONS VACANT

COURTAULDS LIMITED require the following staff: Organic Chemist for the Organic Chemical Section of the Textile Research Laboratory. Candidates must have a good B.Sc. Honours degree in chemistry or an equivalent qualification and should not be more than 35 years of age. Research and textile experience are desirable but not essential. Reference No. C.A.A. 32.

Applicants should write for a detailed questionnaire to the DIRECTOR OF PERSONNEL, Courtaulds, Limited, 16, St. Martins-le-Grand, London, E.C.1, quoting the appropriate reference number.

THE CIVIL SERVICE COMMISSIONERS invite applications for the following permanent appointments calling for scientific qualifications of all kinds to be filled by competitive interview:—

(1) About 30 SENIOR SCIENTIFIC OFFICERS in Government Departments.
Candidates must be at least 26 and under 31 years of age on 1st August 1948. They must have obtained a university degree in a scientific subject or in Mathematics with first or second class honours or an equivalent qualification or possess high professional attainments, and they must have had at least three years appropriate post-graduate or other approved experience.

(2) About 170 SCIENTIFIC OFFICERS in Government Departments. Candidates must be at least 21 and under 28 years of age on 1st August, 1948 (under 31 for candidates holding permanent appointments in the Experimental Officer Class of the Government service). They must have obtained a university degree in a scientific subject or in Mathematics with first or second class honours or an equivalent qualification or possess high professional attainments. But candidates sitting for their degrees in the summer of 1948 will be admitted to the competition.

The inclusive London salary scales are:—
Senior Scientific Officer £650 × £25 — £850
Scientific Officer £360 × £25 — £600
Rates for women are somewhat lower.

Superannuation provision is made either under the Federated Superannuation System for Universities or under the Superannuation Acts, according to appointment.

Further particulars and forms of Application are obtainable from the SECRETARY, Civil Service Commission, Scientific Branch, 27, Grosvenor Square, London, W.1., quoting No. 2114 to whom completed application forms should be returned not later than 15th March, 1948.

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DYESTUFFS Export Manager, forties, successful sales executive, continental, overseas markets, life experience commercial, technical, languages, would consider offers well-paid permanent position. Box No. 2582, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

WORKING NOTICES

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THE Proprietor of British Patent No. 530727, entitled "Solvent Treatment of partially polymerised oils to obtain drying and non-drying oils" offers same for license or otherwise to ensure practical working in Great Britain. Inquiries to SINGER, EHLERT, STERN & CARLBERG, 28, East Jackson Boulevard, Chicago 4, Illinois, U.S.A.

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ONE steam heated **DRYING OVEN** by Chambers, having 12 compartments, each 28 in. by 35 in. by 4½ in. Each compartment fitted with steam coil. Overall dimensions 7 ft. high by 6 ft. wide, 3 ft. 6 in. deep.

One Vertical Stainless Steel **POWDER MIXER**, 24 in. by 10 in. with overdriven agitator fitted with three paddles. Vessel arranged for bench mounting.

One steam operated **DRESSING STERILIZER** by Wilmot Castle Co., U.S.A. 4.5 cu. ft. for 30 lb. steam pressure. Comprising steam jacketed chamber 3 ft. by 1 ft. 4 in. diam. with pressure gauges, reducing valve and vacuum ejector. Self contained boiler 2 ft. 6 in. by 6 in. by 6 in. diam. Complete with Coleman Petrol Blow Lamp.

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One single cylinder **VACUUM PUMP** by Worthington Simpson, type V.B.10. Capacity 10 cu. ft. per minute.

One Gardner Rapid **SIFTER MIXER** size 'A' (15 lb. capacity).

One horizontal Werner Pfleiderer **TROUGH MIXER**, 44 in. by 23 in. by 25 in., single " Z " mixing blade. Arranged for tilting, driven through gearing from fast and loose pulleys.

One **TROUGH PUG MIXER** by Brinjes and Goodwin, 10 in. by 7 in. by 12 in. Bottom slide discharge. Mounted on cast iron frame. Agitating gear driven from fast and loose pulleys.

One **TROUGH PUG MIXER** by Brinjes & Goodwin, 13 in by 9 in. by 15 in. Bottom slide discharge. Mounted on cast iron frame. Agitating gear driven from fast and loose pulleys.

One Portable Stainless Steel **CONICAL FEED HOPPER**, 3 ft. by 2 ft. 10 in. by 2 ft., with slide bottom outlet.

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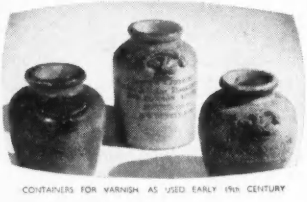

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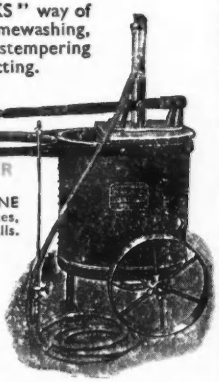

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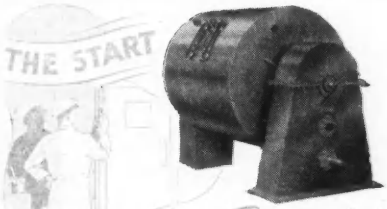

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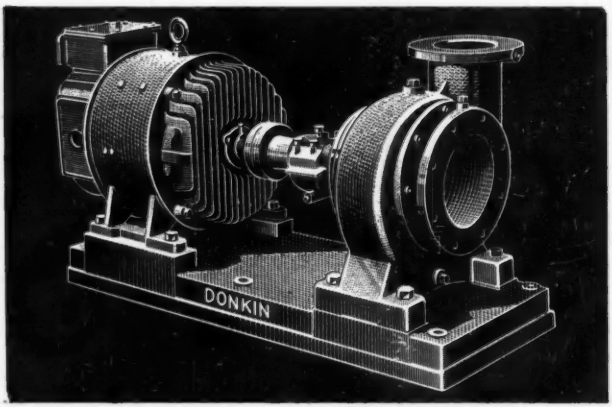

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